December 1982

Incorporating Spectrum User

sinclair user

Issue No 9

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BUMPER CHRISTMAS ISSUE



We sort out printers and interfaces

Caution over use of micros

Sinclair's Spectrum software reviewed

Searle's thoughts on the future

Imports limit sought

Cricket contest winner announced

BEGINNERS' SPECIAL TIPS

Plus nine pages of programs, the latest cassettes and hardware reviewed, helpline, news and your letters.



IF YOU WRITE SOFTWARE THEN READ ON...

15 months ago we had written some excellent Games Software for the ZX-81, but when debugging was finally completed we realised that much of the work remained.
Who could we rely on for the effective marketing and production of our efforts?
Who would give our software the chance it deserved?
No company was really giving ZX Software the professional backup and production it deserved so we created Quicksilva to fulfill this role.
Now Quicksilva has developed a set of specific policies to match our beliefs about how a company of this kind should operate.

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The highest priority must be given to customer service — "QS customer relations are the best in this field."

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So if you are a Software Author confronted with the same problems we had 15 months ago, let Quicksilva solve them for you and help you as it helped us.

Yours, Nick Lambert & John Hollis

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or ring our Special Authors' Hotline — Southampton (0703) 20169 Ext. 42 — and we will do our best to give you the answer you are looking for.

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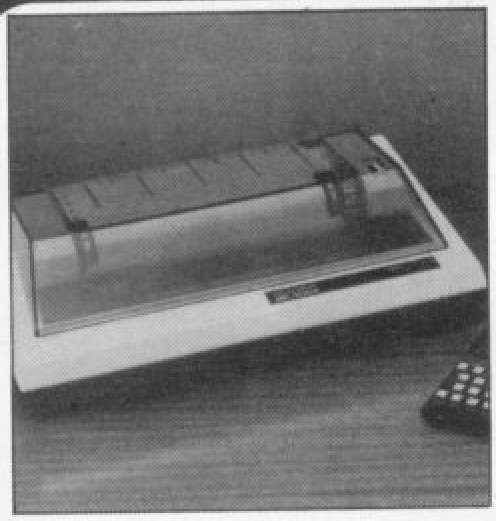
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If you would like to contribute to any of the Sinclair User group of publications please send programs, articles or ideas for hardware projects to:
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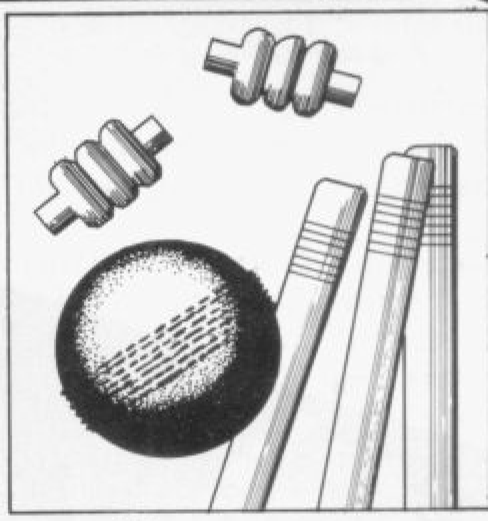
Programs should be on cassette and articles should be typed. We cannot undertake to return them unless a stamped-addressed envelope is included.
We pay £10 for each program published and £50 per 1,000 words for each article used.

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NEXT MONTH

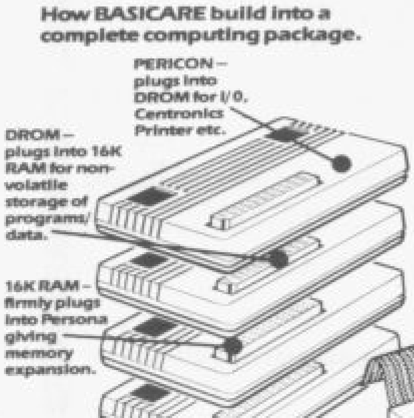
We begin a series intended to teach you good programming and we look in-depth again at the software available for the education market.

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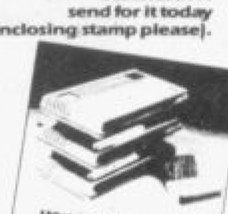
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BASICARE MICRO SYSTEM



Christmas order glut expected

AS CHRISTMAS approaches, hundreds of small firms are gearing to meet the expected glut of orders. To the surprise of many, the market for Sinclair computers and their software and hardware additions appears to be affected by the normal seasonal fluctuations.

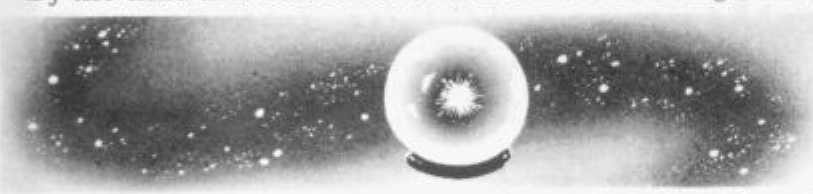
During the summer months, few people were interested in staying inside looking at a television screen. With the colder weather and the darker evenings, so much heat is generated by the ZX-81s and Spectrums that the central heating can be turned off.

Other factors, such as the launch of the Spectrum, have had an effect on this but the basic underlying pattern seems to be the same as for most consumer items.

Last year there was a big increase in the demand for the ZX-81 in the run-up to Christmas. This year there are likely to be even more stockings filled with items from the Sinclair market.

It will be a big test of the ability of the market to meet the demand. Judging by the letters of complaint which we receive, the biggest test will be for Sinclair Research. Despite many of the companies in the market being small, part-time concerns, we receive very few letters about late or non-delivery of items ordered. By contrast, we have been flooded with letters referring to the problems of the Spectrum.

By the time this edition of *Sinclair User* is being read,



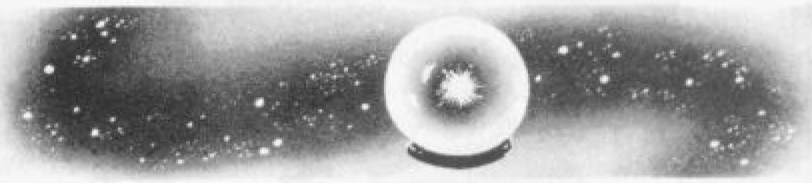
Sinclair Research hopes to have cleared the backlog of orders for the Spectrum. Those hopes, however, are based on a gamble.

Last year the ZX-81 was put on sale in the U.S. and into W H Smith before Christmas. Both those acts, combined with the seasonal increase in demand, resulted in the now-familiar queues of orders.

This year the company tried to avoid that problem by delaying the move into the States and the retail market with the Spectrum. Other problems were sufficient to ensure that delays still occurred.

In the last month deliveries have been increasing and the letters of complaint have fallen to a trickle. Before delivery could be guaranteed at the stated 28 days, however, Sinclair Research decided to try to increase sales. First there was the special education offer to encourage schools to buy the Spectrum and then more recently there was the special offer in *The Observer* which promised there were 500 Spectrums ready for despatch. Also advertisements for the new machine have appeared for the first time in the non-specialist press.

The aim is obviously to catch the Christmas market but the gamble is that the orders could swamp the present level of production. If people order before Christmas on the promise of 28 days' delivery, they will be even more disappointed than the many who ordered them in the



early summer ready for the summer holidays if they do not arrive in time.

As has been argued many times previously, people do not mind waiting for a machine as good and efficient as the Spectrum if they know they will have to wait. If they order something for Christmas and it does not arrive until February, they will not be so understanding.

We hope that the gamble succeeds. The more satisfied Sinclair users there are the more there are likely to be in the future and the greater the potential readership for *Sinclair User*. The danger is that delivery dates would deteriorate quickly, with a corresponding decrease in the reputation of Sinclair Research. The company may have had a good lead on its competitors but brand loyalty can be stretched too far, as many other British industries have discovered.

The long-awaited arrival of the Japanese in the home computer market is here. It will be interesting to see how they cope with the pressures of this fast-expanding market in the next year.

Spectrum User absorbed

In the meantime, we would like to wish all our readers a very merry Christmas. We hope you have many happy hours learning to use your Sinclair computers and promise that we will continue to keep you informed of all that is happening in the market.

After launching our special section devoted to the Spectrum, *Spectrum User*, in September we have decided to absorb it into the rest of *Sinclair User*.

We have made the move to allow us more flexibility in the presentation of information in the magazine. To split the coverage between the Spectrum and the ZX-81 and ZX-80 was proving to be too rigid to permit us to provide the best coverage of the market. From now, all the machines will be covered in all parts of the magazine in our normally comprehensive way.

The SHIVA Christmas Hamper



For the SPECTRUM

	Normal Published Price
By Ian Stewart & Robin Jones	
Easy Programming for the ZX Spectrum	£5.95
Computer Puzzles: For Spectrum & ZX81	£2.50
Machine Code and Better Basic	£7.50
Cassette: Spectrum Special 1	£4.95
By Martin Wren-Hilton	
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£15.75 incl. p. & p.

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By Martin Wren-Hilton	
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AWARI

* The ancient African game of logic. It takes 2 minutes to learn the rules but far longer to master the tactics.
* Select the 'Goat-herd' level of play and it's an addictive game for children (8+) that exercises their minds — not their laser fingers.
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ADVENTURE

* Over 200 places to explore in this machine code game using advanced data compression techniques.
* No random elements — you will need skill, cunning and a sense of humour as you explore caves, forest and castles.
* Evade ruthless pursuers and overcome a host of obstacles.
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The ZX99 has an RS232C output allowing connection with any such printer using the full ASCII character code (you can now print on plain paper in upper or lower case, and up to 132 characters per line) at a variable baud rate up to 9,600

● SPECIAL FEATURES

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AUTOMATIC TAPE COPY: You can copy a data file regardless of your memory capacity as it is processed through the Sinclair block by block.
TAPE BLOCK SKIP: Without destroying the contents of RAM
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The ZX99 contains a 2K ROM which acts as an extension to the firmware in the Sinclair ROM. The ZX99's ROM contains the tape drive operating system and the conversion to ASCII for the RS232C output.

There is an extension board on the rear to plug in your RAM pack (larger than 16K if required). The unit is supplied with one special tape drive lead, more are available at £1 each.

£49·95 + £2·95p+p



● ZX99 SOFTWARE

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- **Sales Ledger (November)**
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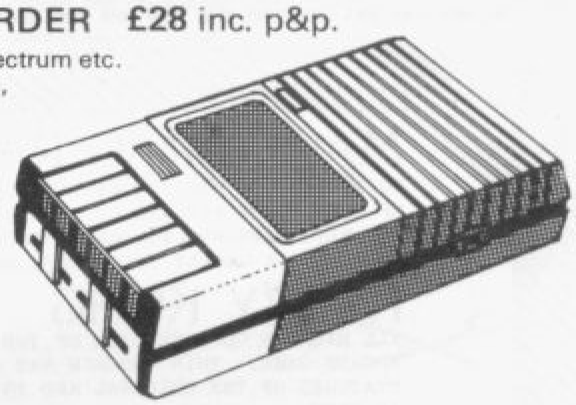
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RS232C (SERIAL) £285 plus £6 Securicor delivery
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This professional printer works with almost any computer with very good upper and lower case typeface.

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The sinclair user Club

Booking Sinclair trend

STAR BARGAIN

THIS MONTH'S special offer, open exclusively to Sinclair User Club members, is aimed at those who look to books as a way of learning more about their machines and that growing number of people who wish to make more serious use of their machines.

From Read-Out Books and Software we have been able to obtain for members a 20 percent discount on its full range of books.

The full range of books with their special prices, which are open only to its members, is given below.

From Micromega, publisher of business programs, we can offer 20 percent off all of its cassettes. They include **Compushare**, **Bank** and **Computax**, which have all helped to expand the uses for the 16K ZX-81. There are also two games tapes, one for the 16K and the other for the basic 1K ZX-81.

The offers are open only to members of the Sinclair User Club and are available until the end of December. To allow new members to take advantage of them, orders can be included with the membership application form which is part of the Christmas Offer form below. Just tick the Membership Only box and include £12 to the address shown.

MICROMEGA	Usual price	Offer price
Compushare	£9.95	£7.95
Computax	£9.95	£7.95
Bank	£9.95	£7.95
Space Trek (16K)	£4.45	£3.55
1K Challenge	£4.45	£3.55

READOUT BOOKS AND SOFTWARE

	Usual price
Learning to Use the ZX-81, Robin Bradbeer	**£4.95**
Learning to Use the ZX Spectrum, Robin Bradbeer	**£4.95**
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Gateway Guide to the ZX-81, Mark Charlton	**£6.45**

Plus £1.20 postage and packing for each order.

Festive learning offer

WITH Christmas approaching, many people are likely to be buying ZX-81s as presents. To enable new owners to derive the full benefits from the new machines we have put together a special package.

For only £26, we are able to offer the Sinclair Research Learning Lab and a year's subscription to the Sinclair User Club, the perfect companion to the ZX-81. If bought individually, the items would cost £31.95.

The Learning Lab contains eight cassettes and an explanatory manual intended to take people through all the stages of getting to know the machine.

There are many benefits to be gained from joining our User Club, as an increasing number of people

continued on page 10

CHRISTMAS OFFER FORM

I wish to take advantage of the special Christmas offer and enclose £26 for a year's subscription to the Sinclair User Club and a copy of the Sinclair Research Learning Lab.

☐ Membership only. I enclose £12 for a year's subscription to the Sinclair User Club.

I own a Spectrum/ZX-81

Name...

Address ....

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Send your coupons to Sinclair User Club, ECC Publications, 30-31 Islington Green, London N1 8BJ. Cheques should be made payable to Sinclair User Club.



The Sinclair User Club

continued from page 9
from all over the world have been finding since it was started in June.

The list includes a telephone problem-answering service. Members can telephone at any time for expert advice on problems they have in using their machines. The telephone number is given on the cassette-based news letter, which is sent every two months, and includes articles, helpful hints, games and news about the club.

Members can also take advantage of special discounts on various items in the Sinclair market, both hardware and software.

Each month there is a special offer which, in the last few months, has included a reduction in the prices of the William Stuart Systems ZX-81 Music Synthesiser, the Kempston Electronics click keyboard, the range of Thurna Electronics add-ons.

To take advantage of this exceptional offer, available only until the end of January, fill in the Christmas Offer form below.

If you just wish to join the Sinclair User Club, all you have to do is tick the Membership Only box.

Make sure when completing the form to indicate whether you own the Spectrum or the ZX-8d1, so that we can send the correct cassette.

Britain

Aylesbury ZX Computer Club: Ken Knight, 22 Mount Street Aylesbury (5181 or 630867). Meetings: first Wednesday and third Thursday of the month.

Doncaster and District Micro Club: John Woods, 60 Dundas Road, Wheatley, Doncaster DN2 4DR; (0302) 29357.

Edinburgh ZX Users' Club: J. Palmer (031 661 3183) or K Mitchell (031 334 8483). Meetings: second Wednesday of the month at Claremont Hotel.

EZUG-Educational ZX-80/81 Users' Group: Eric Deeson, Highgate School, Birmingham B12 9DS.

Furness Computer Club: R J C Wade, 67 Sands Road, Ulverston, Cumbria (Ulverton 55068). Meets every other week on Wednesday evenings.

Glasgow ZX-80/81 Users' Club: Ian Watt, 107 Greenwood Road, Clarkston, Glasgow G76 7LW (041 638 1241). Meetings: second and fourth monday of each month.

Hassocks ZX Micro User Club, Sussex: Paul King (Hassocks 4530).

Inverclyde ZX-81 Users' Club: Robert Watt, 9 St. John's Road, Gourock, Renfrewshire, PA19 1PL (Gourock 39967). Meetings: Every other week on Monday at Greenock Society of the Deaf, Kelly Street, Greenock.

Keighley Computer Club: Colin Price, Redholt, Ingrow, Keighley (603133).

Merseyside Co-op ZX Users' Group: Keith Driscoll, 53 Melville Road, Bootle, Merseyside L20 6NE; 051-922 3163.

National ZX-80 and ZX81 Users' Club: 44-46 Earls Court Road, London W8 6EJ.

North Hertfordshire Home Computer Club: R Crutchfield, 2 Durham Road, Stevenage; Meetings: first Friday of the month at the Settlement, Nevells Road, Letchworth.

North London Hobby Computer Club: ZX users' group meets at North London Polytechnic, Holloway Road, London N7 each Monday, 6pm.

Nottingham Microcomputer Club: ZX-80/81 users' group, G E Basford, 9 Holme Close, The Pastures, Woodborough, Nottingham.

Orpington Computer Club: Roger Pyatt, 23 Arundel Drive, Orpington, Kent, (Orpington 20281).

Perth and District Amateur Computer Society: Alastair MacPherson, 154 Oakbank Road, Perth PH1 1HA (29633). Meetings: third Tuesday of each month at Hunters Lodge Motel, Bankfoot.

Scunthorpe ZX Club: C P Hazelton, 26 Rilestone Place, Bottesford, Scunthorpe; (0724 63466).

Sheffield: Andrew Moore, 1 Ketton Avenue, Sheffield S8 8PA would like people interested in starting a club in the area to contact him enclosing a stamped-addressed envelope for details.

Sittingbourne: Anurag Vidyarthi (0795 73149). Would be interested to hear from anyone who wants to start a club near the Medway towns.

Swindon ZX Computer Club: Andrew Bartlett, 47 Grosvenor Road, Swindon, Wilts SN1 4LT; (0793) 3077. Monthly meetings and software library.

Thames Valley ZX Users' Club: Richard Shepherd, 22 Green Leys, Maidenhead, Berkshire SL6 7EZ; (0628) 21107 (evenings and weekends). Hopes to start meetings on a regular basis.

Worle Computer Club: S W Rabone, 18 Castle Road, Worle, Weston-super-Mare BS22 9JW (Weston-super-Mare 513068). Meetings: Woodsprings Inn, Worle, on alternate Mondays.

ZX-Aid: Conrad Roe, 25 Cherry Tree Avenue, Walsall WS5 4LH (Walsall 25465). Please include sae. Meetings twice monthly.

ZX Guaranteed: G A Bobker, 29 Chadderton Drive, Unsworth, Bury, Lancashire. Exchanges information and programs throughout the country.

ZX-80/ZX81 Users' Club: PO Box 159, Kingston-on-Thames. A postal club.

Overseas

Belgium, France, Luxembourg: Club Sinclair, Raymond Betz, 38 Chemin du Moulin 38, B-1328 Ohain, Belgium (322 6537468)

Belgium, Netherlands: Microcomputer Vereniging BZW, Paul Glenisson, Priester de l'Epéestraat 14, B-1200 Brussels, Belgium (322 7349954)

Denmark: Danmarks National ZX-80/81 Klub (DNZK), Jens Larson, Skovmosevej 6.4200 Slagelese, post giro 1 46 24 66.

ZX-Brugergruppen i Danmark, Boks 44, 2650 Hvidovre. Gratis medlemskab og gratis blad til enhver interesseret.

East Netherlands: Jonathon Meyer, Van Spaen Straat 22,6524 H.N. Nijmegen; (080 223411).

Germany: ZX-80 Club, a postal club; contact Thomas Jenczyk. Hameln, Postfach 65 D-3250 Hameln, Germany.

Indonesia: Jakarta ZX-80/81 Users' Club, J.S. Wijaya, Jakarta, Indonesia.

Republic of Ireland: Irish ZX-80/81 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.

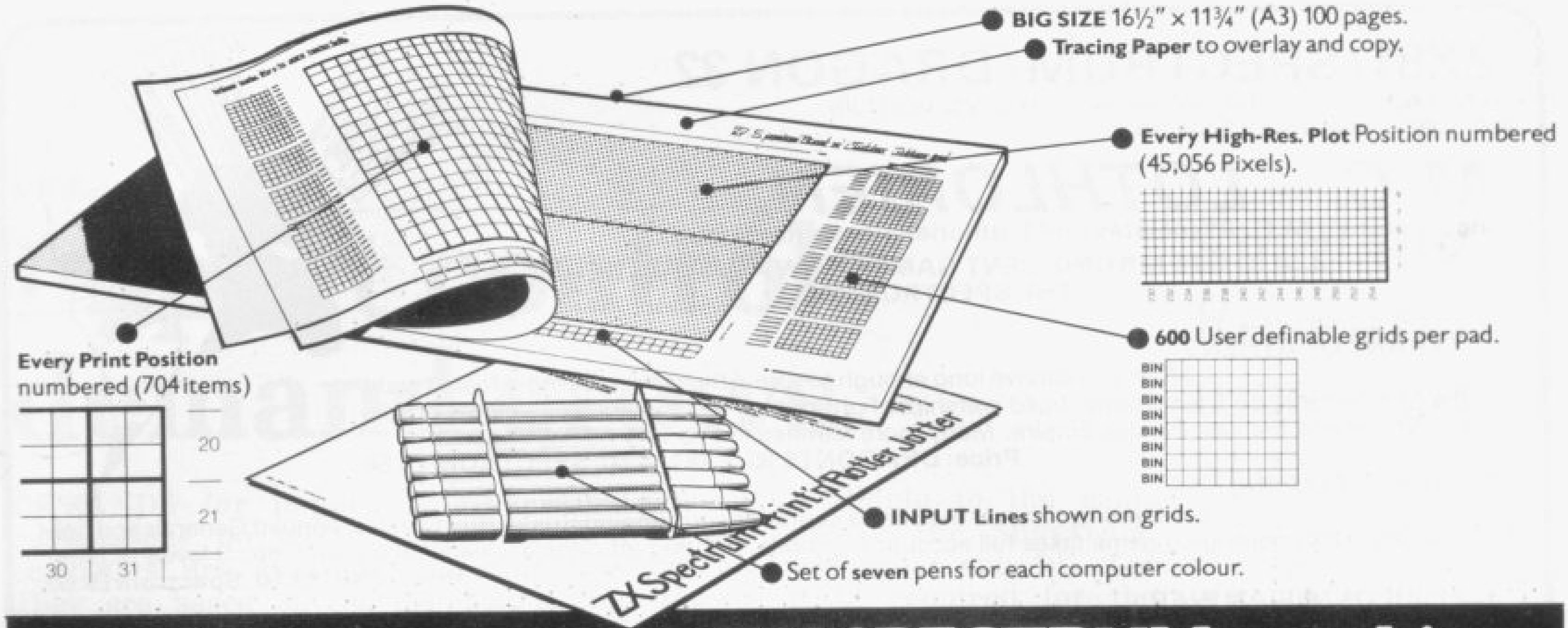
Singapore: Sinclair Users' Group: Eric Mortimer, 1D Wilmer Court, Leonie Hill Road, Singapore.

South Africa: Johannesburg ZX80/81 Computer Users' Club: S Lucas, c/o Hoechst SA (Pty) Ltd, PO Box 8692, Johannesburg. Teaches Basic and machine code, interest in hardware.

Johannesburg ZX Users' Club: Lënnërt ER Fisher, PO Box 61446, Marshallstown, Johannesburg.

Spain: Club Nacional de Usuarios del ZX-81, Joseph-Oriol Tomas, Avda. de Madrid, No 203 207, 10, 3a esc. A Barcelona-14 Espana. International ZX Spectrum Club: Gabriel Indalecio Cano, Sardana, 4 atrico 2a, San Andres de la Barca, Barcelona. Send international reply coupon. Produces a bi-monthly magazine.

United States: Bay Area ZX-80 User Group, 2660 Las Aromas, Oakland CA94611. — Harvard Group, Bolton Road, Harvard MA 01451; (617 456 3967).



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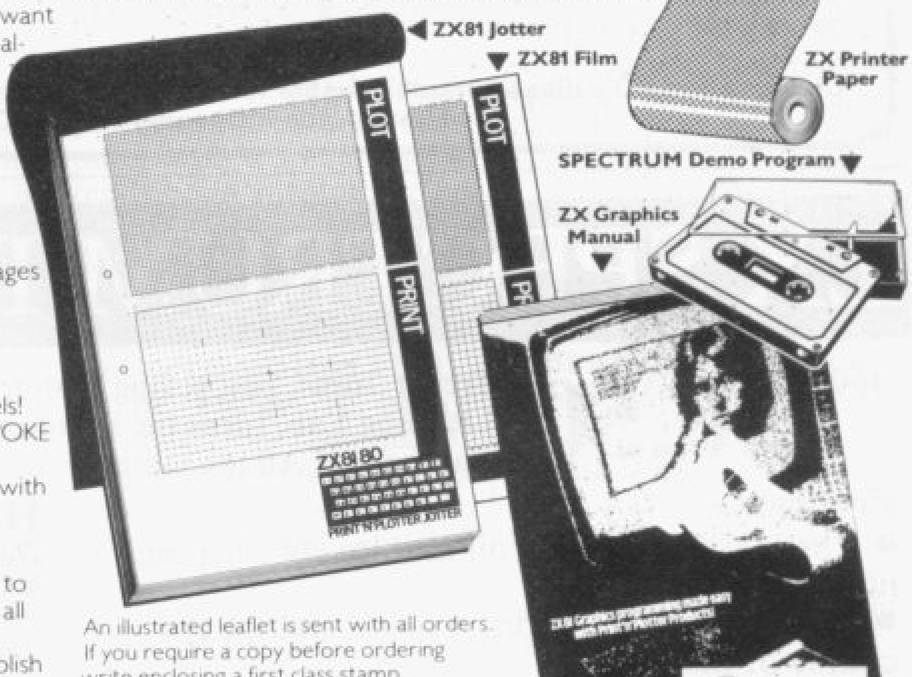
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Import controls demand grows

DEMANDS for import restrictions on microcomputers are growing. They are based on the fears of British producers of a Japanese invasion similar to that which which has resulted in the decline of so many industries in the U.K.

"There are increasing demands among our members for some kind of reaction to the threat from Japan, "says David Broad. chairman of the British Micro Manufacturers' Group.

He accuses Japanese producers of unfair competition. "They have help with their development costs from the government and also further assistance to allow them to undercut producers here," he adds.

Broad, who is also chairman and managing director of micro manufacturer Comart, says that although companies in the group are young and growing fast, help is needed to ensure that the British industry continues to grow. No direct help is available from the Government, so some form of import restriction is needed.

BMMG is a group of 21 of the leading companies in microcomputers, including Sinclair Research. As the fears have grown, a number of new machines have been announced by Japanese companies. The latest is Sanyo, which is launching three machines.

The PHC-25 is the biggest and is aimed at the same people who would be considering buying a Spectrum. It has 16K of on-board RAM, can have nine colours on the screen at one time, has touchpad keyboard, and costs £150.

Its 16K has 14K available to the user, unlike the Spectrum, which has only 9K. The RAM required for the display has been reduced because the machine includes a special memory area, called video RAM, which contains the screen display.

Unlike the Spectrum the Sanyo can control a tape recorder directly from a program. It also has extensive Microsoft Basic.

The PHC-10 is a battery-powered £60 training computer with a single-line liquid crystal display and no provision for television display. The other machine, the PHC-20, has 4K RAM with no colour and will cost about £100.

The range is being marketed by Logitek of Chorley, Lancashire. No date has been fixed for the launch but it is expected to be soon.

ZX-81 in kitchen

ANYONE still worrying about whether the ZX-81 has any practical uses should visit Milton Keynes. The Development Corporation has built a house for the future and in the kitchen a ZX-81 can be seen helping to manage the household.

The machine controls items such as deep-freeze stocks, recipes and shopping lists.

The house has been opened as part of the Corporation contribution to Information Technology Year. Its purpose is to illustrate the practical uses of information technology in the home.

Apart from the Sinclair machine, a wide variety of other companies have products on view indicating a full range of the technology available for the home.

The house is at The Pavilions, Cottisford Crescent, Great Linford, Milton Keynes and is open from Thursday to Sunday from noon until 6pm until April 4.



ZX-81 in the Information Technology Year house at Milton Keynes.

Sinclair Research message spreads

THE MESSAGE of Sinclair is spreading quickly all over the world. On the basis of sales of *Sinclair User*, ZX-81s are being plugged into television sets throughout most of the developed and developing world.

The magazine now sells about 4,000 copies each month overseas. The largest number goes to the Scandinavian countries — Sweden, Norway, Finland and Denmark — with the next major area of sales being France and the Benelux countries — Belgium, Netherlands and Luxembourg.

Benelux and Scandinavia are areas where *Sinclair User* has been read almost from the first issue in April. Much of the rest of the world has been convered by agreements with distributors in the last few months.

The magazine now goes to the Far East, the Middle East — mainly Saudia Arabia — most parts of Europe, North America and South Africa. The major exceptions are West Germany and Australasia.

Terry Cartwright, managing director of ECC Publications, which publishes *Sinclair User*, says that as yet sales in the U.S. are not very great but he expects them to improve in the next few months as sales of the Timex Sinclair 1000 grow.





Contest craze rising

A NEW CRAZE for selling competition tapes seems to be growing, with Artic and Automata setting the pace. A £10,000 cash prize is being offered to the first person who completes the new Artic Computing game, **Krackit**, successfully.

The money is being offered jointly by Artic and a Canadian company, International Publishing and Software, which is organising the competition.

The cassette has rules on side one and the game on side two. It consists of 12 riddles, graded by level of difficulty.

Pimania, from Automata Cartography, is part of the growing mass of adventure software. Christian Penfold, the programmer behind the project, stresses that it is more than a game.

The idea is based on Kit Williams' book, *Masquerade*.

Spectrum on time?

SPECTRUM order delays are a thing of the past. That is the official comment from Sinclair Research after a summer in which some people have had to wait more than four months for their machines.

A spokesman said that orders being placed at the end of October were being met within 28 days and the backlog from before that was expected to be cleared by the first week of November.

He added that the special offer to readers of *The Observer* at the end of October would not affect the speed with which the backlog was being reduced.

He added that the company is trying to increase output to be ready for the launch overseas in the early months of 1983.

To help increase output Sinclair has appointed a further sub-contractor, Thorn-EMI at Feltham, Middlesex. The company and Timex in Dundee are said to be making 30,000 Spectrums a month.

Meanwhile, Sinclair's other new products are expected to be on sale sometime in the new year. The most accurate estimate anyone is willing to give is that the Microdrive and the RS232 interface will be appearing in the first three months of 1983.

Launch of Oric is postponed

A NEW microcomputer released every month was the forecast for the end of this year but it now looks as if prospective buyers will have to wait until next year.

The problems began with the BBC microcomputer and spread to the Spectrum. Delays inincreased to several months and the queues of angry customers grew.

Now the new Oric One computer, which was designed for direct competition with the Spectrum, has run into difficulties. Peter Harding, sales director of Oric Products, says that the ULA for the computer had been designed to circumvent the kind of problems experienced by Acorn and Sinclair. The previous difficulties with ULAs have been overcome but now there is another problem. Oric has found that it has not produced sufficient to satisfy expected demand.

As a result of the delays, the Oric One will be launched in early December — not October as had been expected. Harding says: "I am absolutely confident that our shipping date will be firmly adhered to."

Second-hand market expanding

THE MARKET for second-hand ZX-81s is growing rapidly. One small company, Second Hand Sinclairs, has had a rush of orders since placing one advertisement in *Sinclair User*.

The business is run by Arthur Sampson, of Biscombe, Stroud, Glos. He says: "Most of the machines have been from people who wanted to upgrade to the Spectrum. I have been making about £15 on each machine and I am selling about three a week."

Sampson's business ran well for a time but soon he realised that demand for the machines was too great for him to handle. "Second Hand Sinclairs is something which I run in my spare time. I soon found that I had very little spare time left."

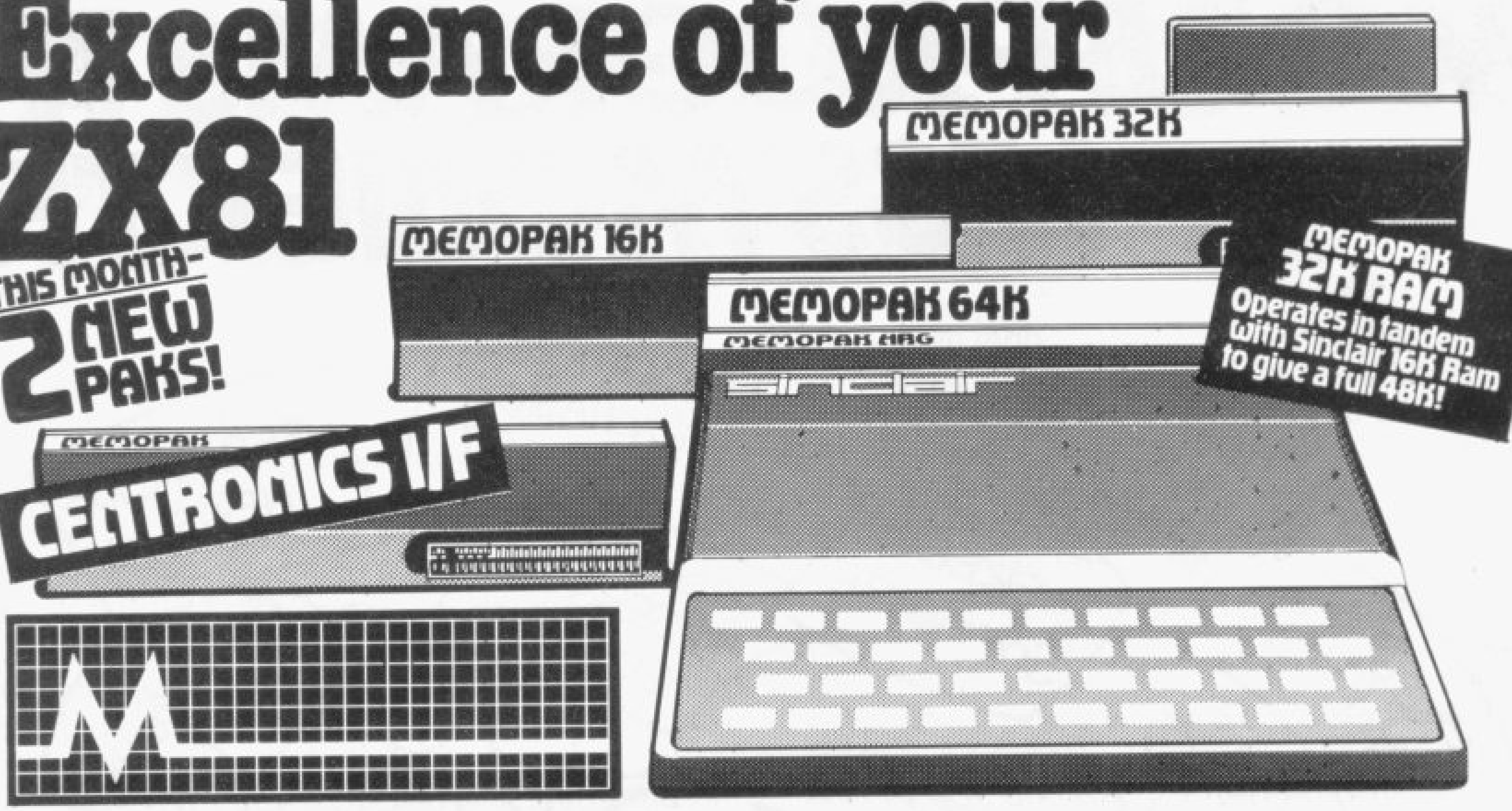
Second Hand Sinclairs stopped buying microcomputers for a time and Sampson tried to sell the stock which remained. Now he has decided to continue with the business for a period. He says:

"I am not making much profit. I may buy a 16K ZX-81 and 20 tapes but I may sell only the ZX-81 and a few tapes. For some reason the rest will not sell. That is the problem, I sell bits and pieces and the things which don't sell just pile up.

"I will not be advertising any more but I will deal with any custom I receive."

The prices of second-hand machines depend on the quality but, according to Sampson, buying a ZX-81 with RAM pack from a second-hand dealer can be cheaper than buying a new 1K unit from Sinclair.

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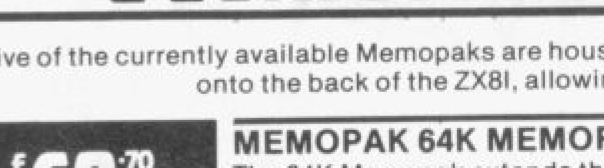
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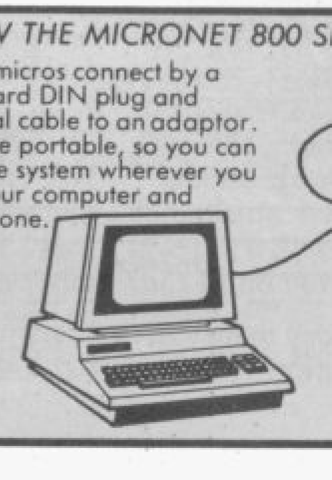
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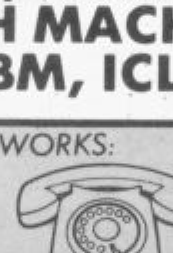


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- **Purchase 'Downloadable' Software:** Many 'telesoftware' programs can be bought from the system and loaded down direct to your micro. But don't worry – there's plenty of warning if any MICRONET service you're planning to use carries a charge.
- **Electronic Mail:** A mailbox service on Prestel allows you to exchange messages with other Prestel or Micronet users. Messages are held securely and only you can collect them.
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Beginners' assistance is not appreciated

WHAT is going on at *Sinclair User*? I bought the October edition only to find on page 25 an article entitled A lifetime's obsession can easily be acquired, which also appeared on page 23 of the September edition and page 27 of the August edition. A very similar article also appeared on pages 50 and 51 of your May edition.

I would suggest that in pursuing this extraordinary editorial policy you are deliberately misleading those members of the public, including myself, who buy your magazine in good faith regularly, expecting to read a fresh set of articles each month and not the same stuff rehashed month after month.

The only explanation I can perceive for this bizarre situation is that the energies of your staff have been channelled virtually exclusively into the production of the supplement, *Spectrum User*. I would take this opportunity to remind you that the vast majority of Sinclair users are ZX-81 users and I suspect that this is also true of your readership.

By all means try to cater for Spectrum users but let it be within the format of the magazine and not in a 24-page supplement which can serve only to create a privileged minority within your readership.

M P Nadin,
Tuffley,
Gloucester.

• *The reason for including the regular Starting From Scratch spot is that with sales of the ZX-81 running at many thousands a month, there is always a large number of people who are still encountering all the problems most users had when they bought their machines.*

The article occupies one page which, in a total in the October edition of 39 editorial pages, is not a great deal to have to give up if it helps others to take the first steps to find how to enjoy their new machines.

As you will have noticed, in this issue we have decided to incorporate Spectrum User *within the rest of the magazine. While disagreeing that the vast, majority of our readers own ZX-81s, we felt that having a separate section limited our flexibility to bring you the best news on the whole range of Sinclair machines.*

Voucher alternative

ANY DAY now I will be receiving my Spectrum, of which I have heard some very good reports, but there is something which I find a little puzzling — the £10 voucher which can be used in part-payment for a ZX printer or to buy a complete pack of five rolls of printer paper.

Supposing I do not want a ZX printer or the rolls; surely the compensation for the delay is being reduced by £10? Why not permit the voucher to be used for any piece of ZX equipment, like some tapes, or part payment for the 48K RAM add-on?

S Chamberlain,
Melbourn, Herts.

•*Sinclair Research says that alternative methods for compensation were considered but it decided against offering the voucher for future products. As it had and has no fixed launch or availability dates it was felt that it would be unfair to customers. Also at the time the offer was made there was no Spectrum software available from Sinclair.*

More news from the ROM

I WOULD like to make a few points about my Spectrum ROM article in your October issue, as I have now completed its disassembly.

A RST 10 is also used to output characters to the printer and microdrives, so to be sure of screen output, place at the beginning of any routine the instructions:

```
LD A,02h
CALL 1601 h
```

If the I register contains a number between 64 and 127, picture break-up occurs. That must be something to do with the ULA.

There is a misprint in the listing — the beginning of line 30 should be 'DEF FN B$(A) . . .'

Andrew Pennell,
Cliftonville,
Kent.



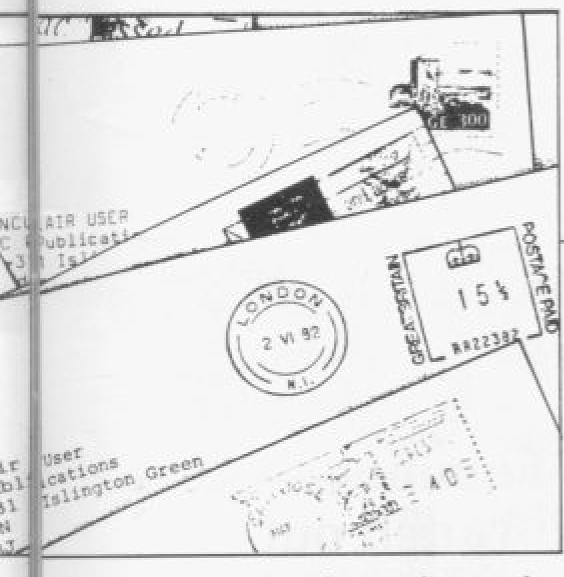
Radio group still exists

I WRITE to inform your readers of the continued existence of the Sinclair Amateur Radio User Group which, despite an announcement that it will cease to function will, in fact, continue to function for the foreseeable future. SAROG, formed in 1981, was set up to provide radio amateurs with the means of sharing experience and expertise in the use of the Sinclair micros in amateur radio projects.

Achievements to date include the full implementation of Morse code transmit and receive in SLOW mode on the ZX-81 and the same functions are being sought in radio teletype. The same models are also being pursued with the Spectrum.

The group is non-commercial, non-profit — we sell nothing nor do we use advertising material. We share our information via a newsletter which usually runs to about 16 sides of A4 paper. It is hoped soon to produce it quarterly.

Membership is open to all licensed radio amateurs in the U.K. and Europe, though it is to be noted that we cannot ac-



cept members from the Americas. U.K. membership costs £5; non-U.K. residents should pay £8 in sterling only. Full payment details for non-U.K. enquirers may be had for 21RCs. All U.K. enquiries should enclose s.a.e. Telephone enquiries are not welcome.

Some countries may require extra subscription due to high airmail charges, if airmail is required. We cannot accept those with other micros.

May I say that the reason we are able to continue is in no small part due to the help obtained from some members who came to us originally from information supplied in an earlier issue of your magazine.

Paul Newman,
G4INP,
Sinclair Amateur Radio User Group.
3 Red House Lane,
Leiston,
Suffolk IP16 4JZ.

Home learning is best

SINCLAIRVOYANCE — September — drew attention to the dangers of home education. The concluding sentence — "At the moment, however, the problems of transferring learning to the home seem too great to be surmounted" would seem to be denied by the more than 700 members of Education Otherwise, most of whom are educating their children at home — otherwise than at school.

My view of the use of computers in learning is that they are best when used as aids to developing thinking and logical skills. Logo is an excellent example. The idea of using them for the kind of quiz games which seem so popular among writers of educational software at the moment seems little better than text books.

At a recent conference of Education Otherwise, attended by about 250 adults and 100 children, a room was set aside for a demonstration of computers and their uses. I was there with two ZX-81s and met a number of people who already use a computer for home education or were thinking of doing so. It seems computers certainly have a place in home-based education.

I must confess, however, that I see one of the main advantages in home-based education as being the greater availability of adults' time in such a situation. Compared to that, computers are a poor substitute.

One other point mentioned in Sinclairvoyance was that schools are a major stage in learning social skills. Most of my friends involved in home-based education would argue that most schools encourage the wrong kind of social skills — unhealthy competitiveness being mentioned by many — and that there are plenty of other places for social contact outside school.

C W Parker,
Toddington, Glos.

Music aid good value

IN THE October issue of *Sinclair User*, I feel that the article on the ZX-81 Multi-Sequencer entitled Roll over Beethoven was somewhat unfair in describing its instructions as incomprehensible. As a professional musician, I find the system easy and flexible to produce my own work and good value at £15.

Peter Hanson,
London SW7

Routine crashes

I HAVE owned a ZX-81 personal computer for 10 months, during which time I have had no problems with it. It was a surprise, therefore, to me that while entering machine code into a REM statement earlier this week that problems began to develop.

Until that moment, I had written considerable amounts of machine code for the computer with considerable success but it was the first time I had included the following two instructions in a routine:

```
126 LD a,(hl)
118 halt
```

The inclusion of the LD a,(hl) instruction in a REM statement holding a machine code routine resulted, on listing the statement, either in the truncating of the REM statement or the production of a flashing listing of the statement moving in a diagonal path down the screen.

Inclusion of the halt instruction in a REM statement led similarly to the truncation of the statement on listing although, in addition, that also produc-

continued on page 20

Leap improves calendar

I WAS interested to see William Mitchell's program Calendar — *Sinclair User*, October — as, several years ago, I wrote such a program for my Sinclair Cambridge programmable calculator based on the same method of calculation.

There appears to be an error in the program in that it calculates the years 1800 and 1900 as being leap years, which they are not. That results in an incorrect answer being given for the months of January and February of those years — try December 31, 1799 and January 1, 1800, which will be given as a Tuesday, for both dates. The program can be corrected by:

```
55 IF A = 0 AND B< = 2
THEN LET A = 1
```

That will have the effect of correcting the error, at line 90, of subtracting 1 for all years divisible by four without remainder.

Derek Brown,
Innsworth,
Gloucester.





continued from page 19

ed a four-digit number on the line following the statement. That number, I discovered later, appeared to be dependent on the character used to fill out the REM statement in the first place.

On demonstrating the problem to staff at my local branch of W H Smith, where I purchased it, I was promptly handed a replacement. Out of curiosity, I decided to carry-out the same demonstration test on the machine in the shop before taking it. To may surprise, it suffered the same problem as my original computer. Perplexed, a young assistant supplied me with five more computers to examine, all of which, on testing, had the fault.

G Mallet,
Maidenhead,
Berkshire.

•*We contacted Sinclair Research and the reply was that attempting to list a REM statement with code 118 and possibly 126 may cause crashing. The solution was either to avoid listing the REM or to POKE in the correct values before running the routine and POKE in dummy values afterwards.*

Taking a cool approach

REGARDING the letter from Marion Stubbs in the September issue about over-heating, I had the same trouble when I used my ZX-81 without the 16K RAM pack.

The voltage from the power pack often switches to almost 12V instead of 9V so that inside the ZX-81 the voltage regulator has to deal with a greater voltage dropping — 12V to 5V instead of the 9V to 5V. That resulted in greater power dissipation, so that heat emission of the connected cooling plate rose.

As the case of the ZX-81 has a smaller ventilation hole, much of the heat will remain inside the case.

My final solution was to place a voltage regulator between the power pack and the computer so that the voltage input was reduced to the voltage input of about 8V and own the computer remains very cool.

Paul Cauwe,
Bruges, Belgium.

Families branch out

THE LETTER from L Gross in the October issue of *Sinclair User* attracted a great deal of interest. Gerard Fitzgibbon of 8 Cedar Close, Wokingham, Berkshire and D Bradburn, of The Shieling, Wayside Road, Basingstoke, Hampshire replied that they had written programs on the subject. G.S Baker of 2 Grange Road, Sanderstead, South Croydon, Surrey wrote that a program was in preparation.

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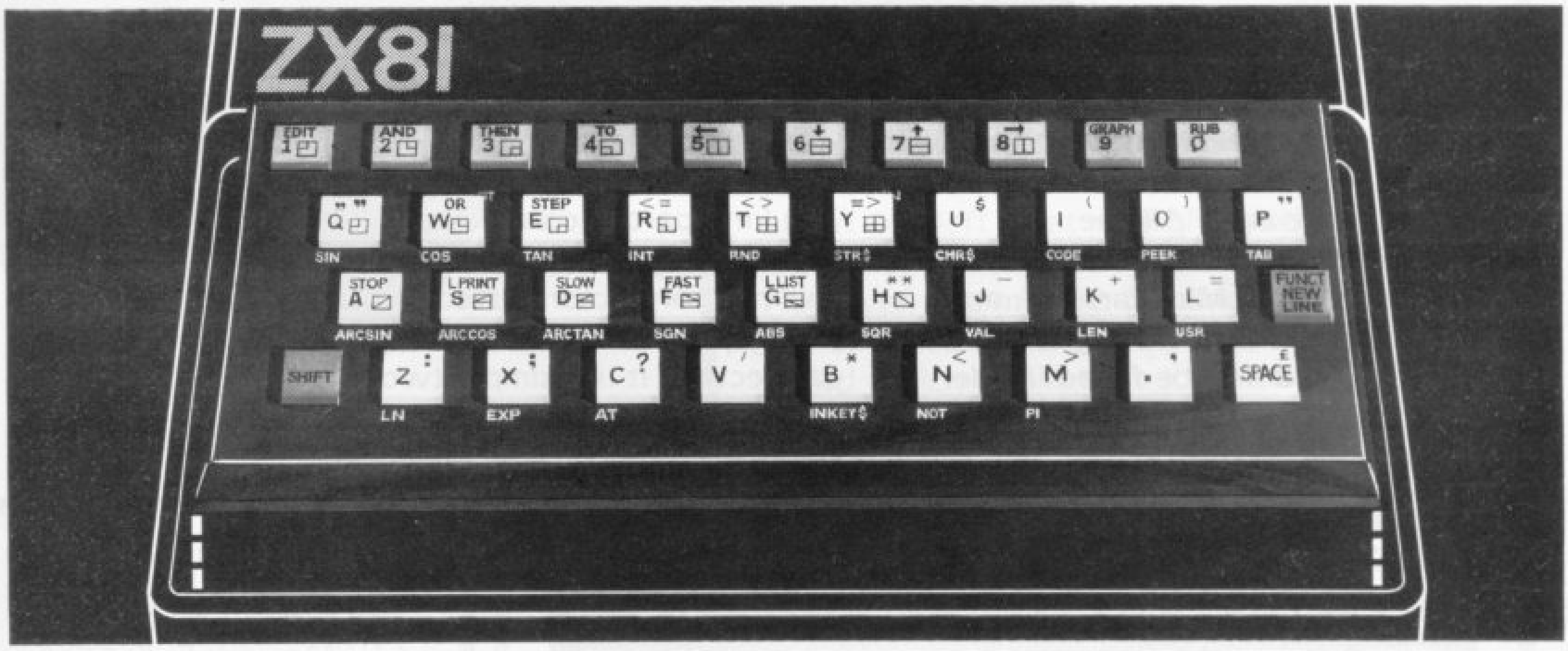
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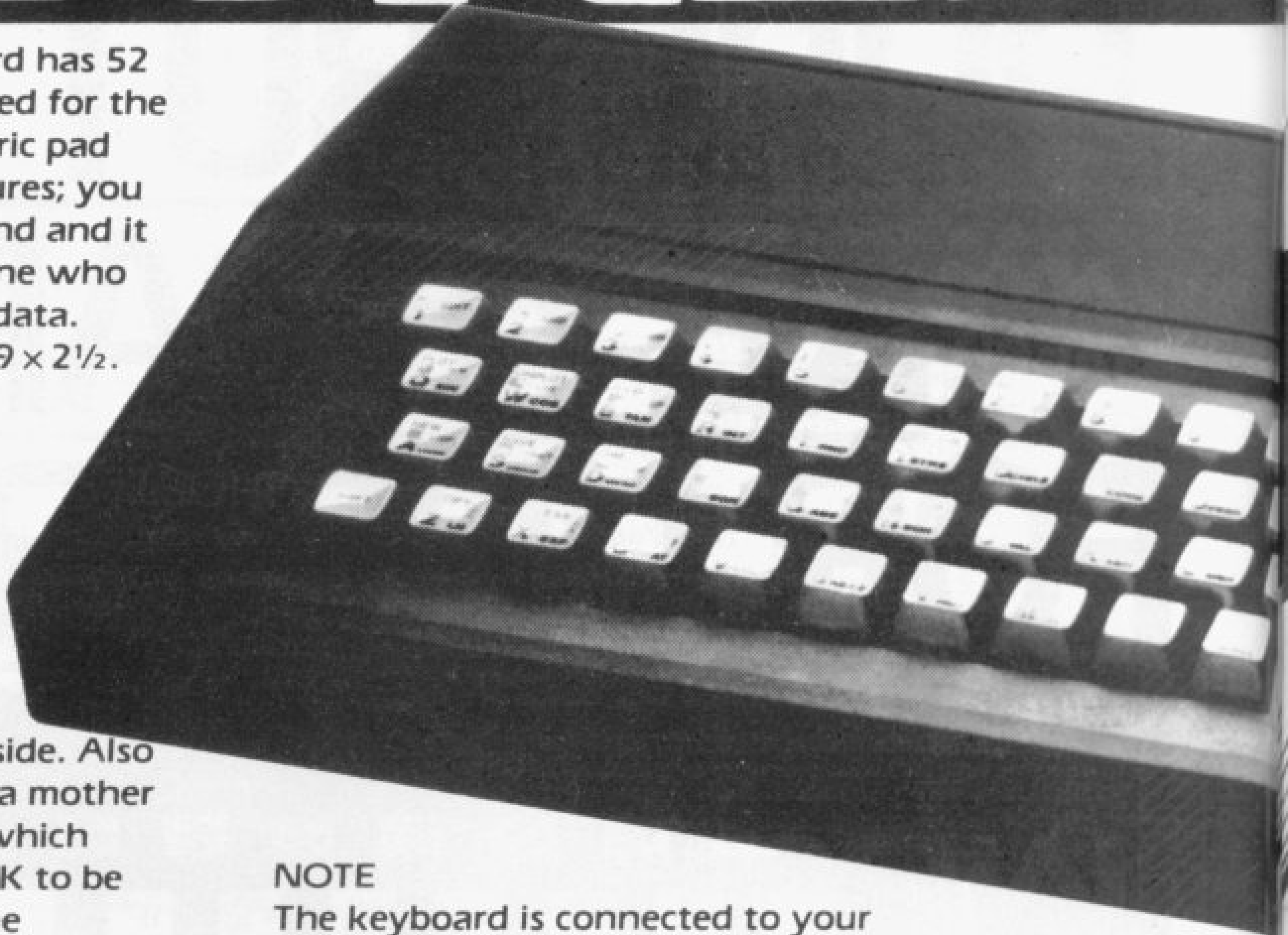
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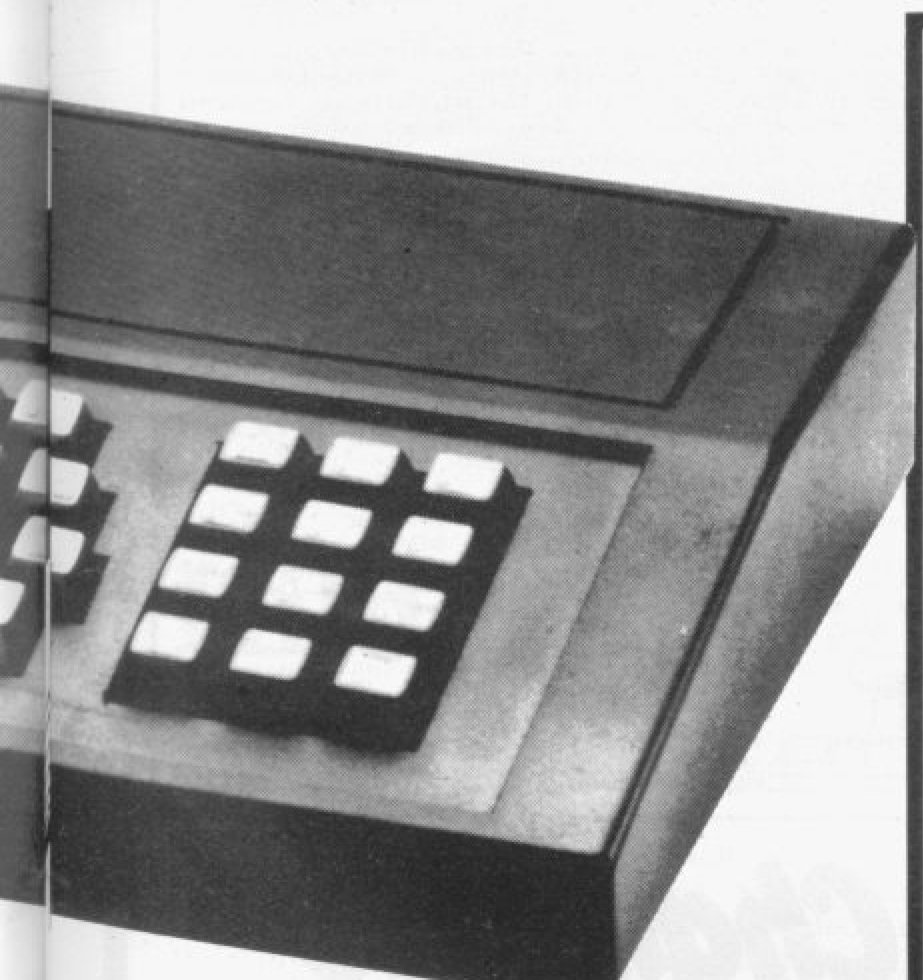
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However, the module does not finish there, it also has a spare holder on the board which will accept a further 4K of ROM/RAM. This holder can be fitted with a 1K/2K/RAM and can be used for user definable graphics so you can create your own custom character sets.

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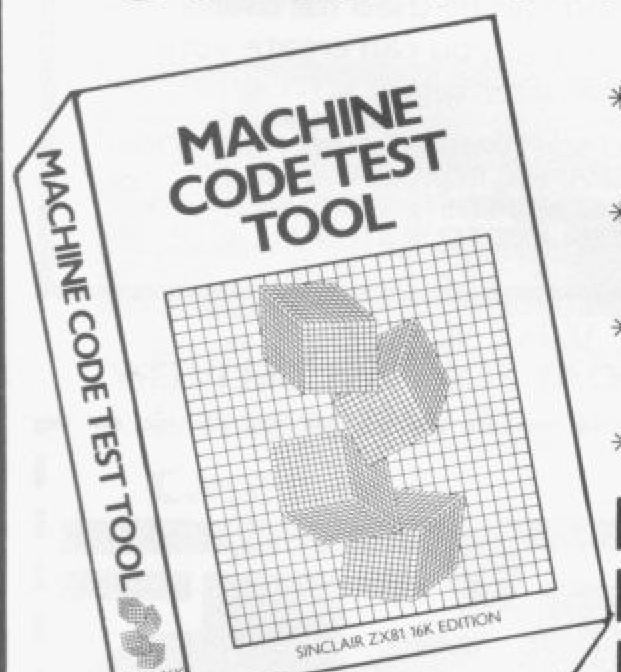
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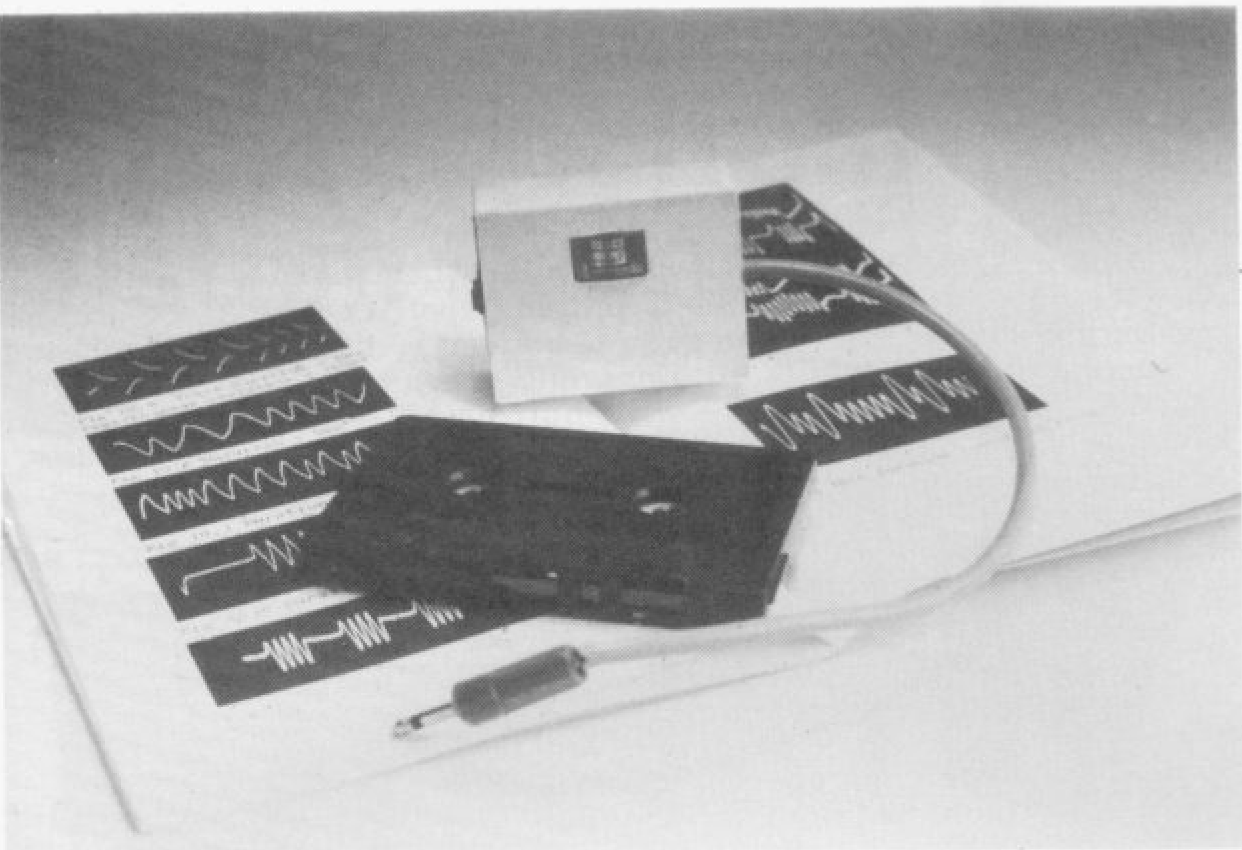
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Aids to good tape use from Hilderbay

Hilderbay aiming at tape users

HILDERBAY, which specialises in business programs, has produced three products for the tape user. The first and easiest to use is a level meter which allows you to LOAD the programs at a constant level and to identify tape defects, such as sudden changes in level.

The second is a book which explains how to get the best from your tape recorder and even hints on which one to buy. It also contains some very good tips on loading "unloadable" tapes. The third is a test tape which can be used to tune your tape recorder to its peak. That means that you may have to use a screwdriver but that is nothing to the confidence it gives you to know that it is not your tape recorder causing the problem.

All the products are first-class and very easy to use. The meter costs £5.95, the book £2.90 and the tape £4.90. Hilderbay also sells a tape recorder aligned and tested for £24. All prices include VAT and are post free. Hilderbay is at 8-10 Parkway, Regents Park, London NW1 7AA. Tel: 01-485 1095.

ZX-81 gets a home

ZX BUSINESS systems produces three products for housing the ZX-81. One stand houses the ZX-81, notepad and printer on the top, with the ZX-81 and RAM pack clamped to prevent wobble. On the lower level a tape recorder and cassettes can be stored. The unit measures 14in. × 10in. × 4in. and costs £17.50 inc. VAT.

The other two are cases, one made from birch plywood and the other in ABS plastic. Both hold the ZX-81/RAM/tape recorder securely. The plastic version costs £35 — 16¾in. × 13in. × 5½in — and the wooden one £27.50 — 20½in. × 13in. × 5½in. — from ZX Business Systems, 14 Brookfield Gardens, Ryde, Isle of Wight. Tel: 0983-65897.

Protection for software

A DEVICE called the Software Protection Unit will supply battery power for up to three hours on a basic 1K ZX-81 and 1.5 hours with the 16K RAM pack, Microbyte says. It will also stop crashes or errors due to mains fluctuations by using "high-speed detection and switching circuitry". What it consists of is two battery holders for AA cells — you supply the batteries at £3.34 per set — in a black box with a jack socket to take the power supply plug at one end and a power supply plug at the other.

The unit costs £8.60 inc. VAT and postage. It can be obtained from Microbyte, 19 Worcester Close, Lichfield, Staffs.

Microbyte software protection unit



Wood case by Kalenia

A WOODEN case made from birch ply is available from Kalenia Wood Products. There are models for the ZX-81 and the Spectrum. Both hold computer, manual, printer and RAM encased in plastic foam ready for use.

continued on page 26



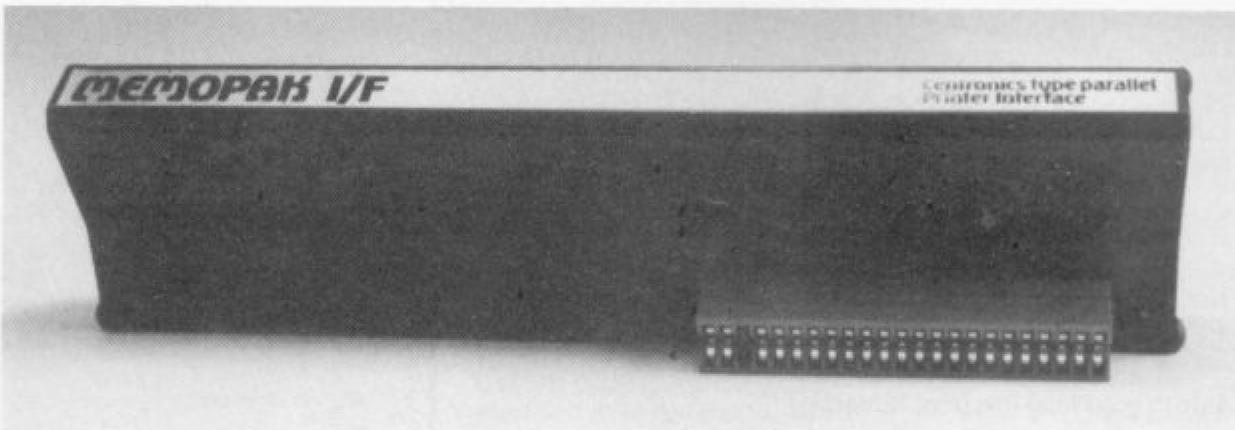
continued from page 25

The cases cost £21 for the ZX-81 version, which can contain the printer or the tape recorder, and £22 for the Spectrum version, which also has space for the Microdrive. Kalenia Products is at 4-6 Auckland Street, Burslem, Stoke-on-Trent ST6 2AX. Tel: 0782 813533 (daytime only).

Cassette lead controller

THE OZ CONNECTOR is a strong aluminium box which contains a switch for controlling the cassette leads on your tape recorder for the ZX-81 or Spectrum. It will allow you to listen as a tape is being loaded and to speak an introduction to the program on tape. It requires no power supply and is robust. It has a built-in amplifier but has a socket at the side to disconnect the internal speaker and connect it to an external amplifier.

At £18 it is more expensive than the Abacus offering at £14.95. The OZ connectgor is available from J Incledon, Long Beach, Warren Road, Brean, Somerset TA8 2RR.



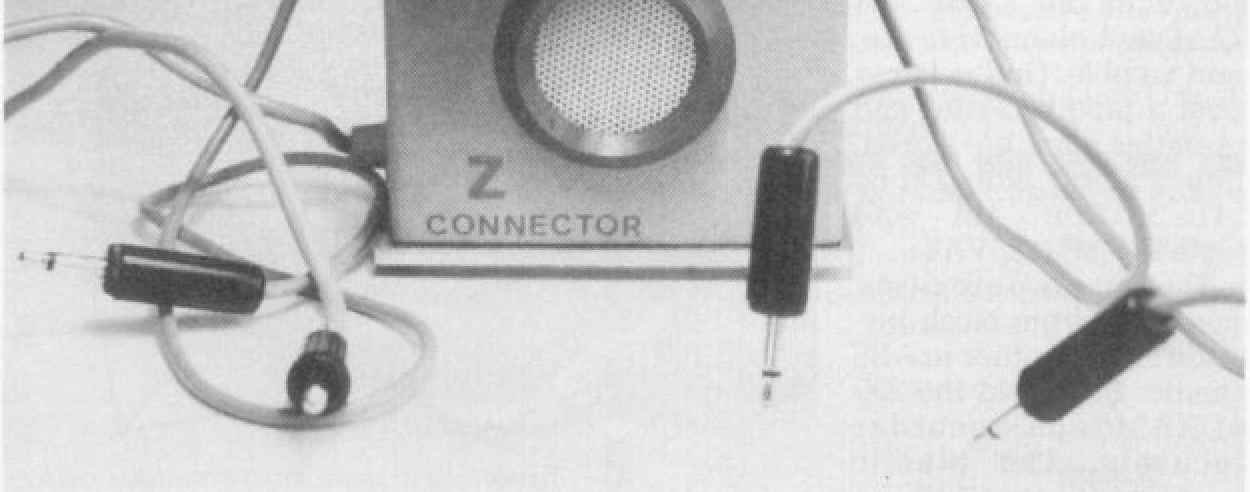
Memopak Centronics interface

Printer interface

MEMOTECH has produced a Centronics parallel interface for the ZX-81. It enables the user to use a proper paper printer to list from a ZX-81. The printer, however, will not print graphics, except with the hi-res pack fitted, or inverse characters. It changes all the inverse letters to lower-case and gives a code C error if invalid characters are used.

Control characters, which can produce double-width characters are available by prefixing a letter with an inverse dot. The commands are used are the ones in Basic — LLIST, LPRINT and COPY. A 2K ROM is included in the pack to do the conversion from Sinclair codes to ASCII, which the printer uses. A high-quality product but with limitations, the Centronics I/F costs £41.90 inc. VAT and postage from Memotech Ltd, 3 Collins Street, Oxford OX4 1XL. Tel: 0865 722102.

Cassette leads connector



Double port by Kempston

KEMPSTON Electronics now has a port which will work on both the ZX-81 and the Spectrum. It is I/O mapped and is operated by address bit 7, so it is free of any expansion by Sinclair. It has an 8255 interface chip which gives three ports programmable for input or output.

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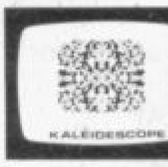
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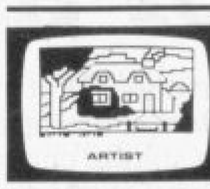
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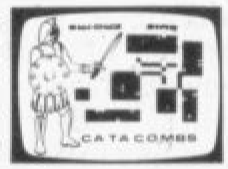


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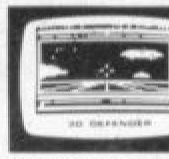
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Ap Pandaal sorts his way through the serials and the parallels to get copies

Getting the better of the ZX printer

WHEN the Sinclair printer was introduced, it was regarded as a real breakthrough both in design and price. Since then, the price has been increased from £49.95 to £59.95 — perhaps to offset the price reduction of the 16K RAM pack and because the special metallised paper has proved to be expensive to use.

Since the printer draws its power from the ZX-81 power supply, that has caused problems due to the heavier current consumption, even though a bigger transformer capable of providing 1-2 amps is provided free by Sinclair with every printer sold; sometimes, a helping hand has to be given to pull through the paper while it is printing.

Those shortcomings prompted several independent companies to find other ways of providing hard copy. Before examining them it is worthwhile looking at the problems involved in transferring information or data from the ZX-81 to a printer.

The keywords LPRINT, LLIST and COPY are subroutines contained in the ROM, so entering one of those keywords from the keyboard is a jump to the relevant section in the ROM.

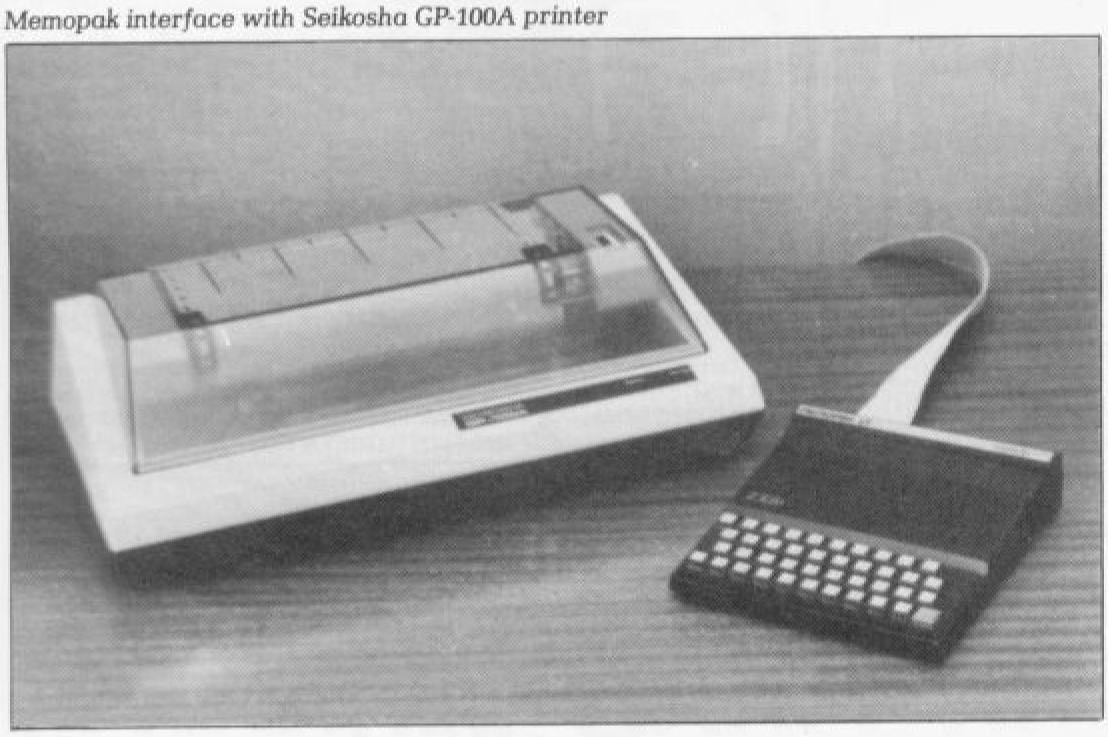
The LLIST command looks at the section of memory where your Basic program is stored and transfers the contents for forwarding to the printer. That process is very complex, since the program is not stored as simple characters but in a much shorter form using tokens to represent the keywords.

Those tokens have to be 'blown up' by the ROM to form a keyword before they can be sent to the printer. Sinclair uses a non-standard way of representing characters which would not be recognised by a printer other than its own. The industry standard, ASCII, ensures that the alphabet, numbers and other characters are each represented by a fixed number, for instance A to Z have the numbers 65 to 90.

There are also standards for connections to printers, two of the popular ones being Centronics parallel and RS232C serial.

In simple terms, a parallel data transfer means that the eight data bits which comprise a character are transferred all at once, while in serial transfer the bits are sent one after another. Parallel transfer therefore is much faster but fewer wires are required for hooking-up a printer with a serial transfer method. Not surprisingly, Sinclair has its own standard which is largely the result of economies in design.

Memopak interface with Seikosha GP-100A printer



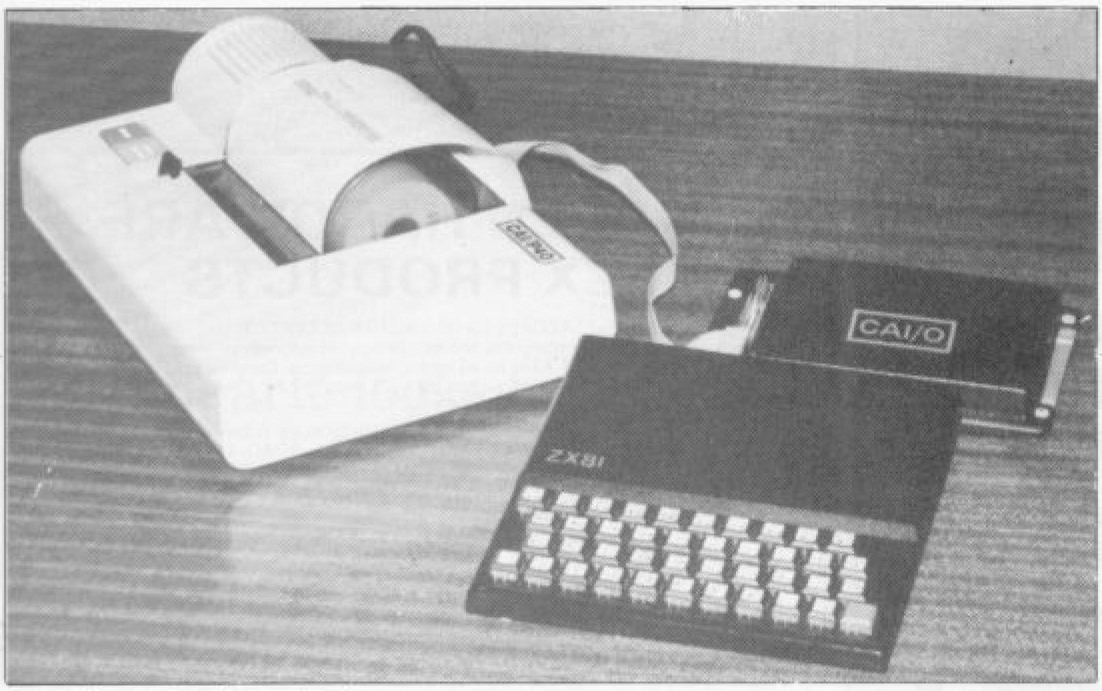
At present there are four companies which have designed interfaces for linking the ZX-81 to a printer:

Company	Interface	Handshake	Price
Cobra	RS232C	Yes	£29.95
Data-Assette	RS232	No	£49.95
Memotech	Contronics	Yes	£39.90
Capital Computers	RS232/ Centronics	Yes	£39.95

The significance of the handshake column is that the speed of data transfer is restricted — up to 300 baud — if handshake is not provided.

The Cobra interface is contained in a neat black box which plugs into the back of the ZX-81. There are two jack sockets on the side of the interface, the bigger one being the serial output while the smaller one is for handshaking. The interface contains a 2716 EPROM, located between 2000 hex and 2FFF hex. In the EPROM are the routines which provide program and data listings. A four-page instruction manual is provided by Cobra which describes how to connect it to a printer.

The interface does not use the Sinclair keywords LLIST and LPRINT but uses a USR call to its own EPROM. Before a program can be listed, the format of the output has to be set by using a table or the manual. It is possible to list a program, list a string of data and also to type in lower-case by using the inverse characters. Unfortunately, there is no way of obtaining a screen copy.



Dean Electronics thermal printer

The ZX-99 made by Data-Assette works in a similar way but is not a true RS232C, as it is not capable of monitoring the status of the printer, since it has no handshake facilities and can therefore operate only at up to 300 baud on most printers. Although more expensive than the Cobra, it provides extra facilities for tape handling.

Capital Computers also markets a combined RS232C and Centronics interface for use with its mother-board system. It has not been possible to test the interface for this survey but it operates on the Sinclair keywords LLIST, LPRINT and COPY. The interface is said to be bi-directional, thus allowing full communication between other intelligent devices.

The Memotech interface is neatly-packaged in a black aluminium case which is similar to RAM modules. The version supplied was designed to be used exclusively with a Seikosha GP100A 80-column printer but the later versions have a small hardware modification to allow them to work any Centronics-type printer.

As well as providing listings in upper- and lower-case, using inverse characters, the interface also allows double-width printing, which is achieved by sending control characters to the printer.

It is also possible to print up to 80 characters on a line by sending-out the relevant control character. A flat 34-way ribbon cable connects the interface to the printer, the two ends plugging-in. It is not possible to print the Sinclair graphics since they are not standard ASCII but the high-resolution module can be used with the interface to print graphs plotted in high resolution.

The unit is easy to use, since the standard keywords are used to list, print and copy and that is a great advantage over some of the other interfaces which have to make use of variables for their operation.

Other than the Sinclair printer, there are only three known printers which have been designed for use on the ZX-81. Dean Electronics markets the model 81 thermal printer which costs £110.97 including the purpose-built interface, a roll of paper, postage and VAT. The printer uses 4.2in. wide thermal sensitive paper and is capable of printing up to 40 columns. The only controls on the printer are power and paper advance.

The interface is contained in a rather over-sized black case. That seems strange, since the interface printed circuit board is populated largely with empty IC sockets, perhaps to allow future use with other computers.

Another annoying feature is that the cable from the interface to the printer is so short that it is difficult to plug or unplug the power, cassette and TV leads to the ZX-81, since the computer has to be to the right of the printer, which gets in the way of the leads.

That apart, the instructions provided with the printer are clear and easy to follow. It is possible to list, print a string of characters and perform a screen copy, both in normal mode and enhanced mode, which means that the characters are printed at twice their height. The printer prints faithfully all the Sinclair character set, including inverse and graphics. That is achieved by using variables in conjunction with USR calls.

It is not possible to copy the screen directly from the keyboard, since the display file is cleared. The only way to deal with that problem is to put the USR call in the program in such a position that the screen is filled first.

The Amber 2400 is a plain-paper dot matrix printer costing £105.24 including interface cable, paper, postage and VAT. The paper rolls are 2¼in. wide, which allows up to 24 characters to be printed in normal mode. The printer can be used in serial or parallel mode with a variety of computers but, sadly, it is extremely difficult to use with a ZX-81.

Amber is the first to concede that the interface provided is not the complete package you need for use on ZX-81. The main reason is that the driving software is not provided in an EPROM as it is on the other interfaces mentioned, but has to be loaded separately from a cassette.

That software has the task of converting the non-standard internal character codes into ASCII and also checking the status of the printer. It is not possible to obtain listings or a screen copy. There are, however, routines to allow the printer to be used with a Spectrum, which is much easier to interface, since it uses ASCII codes.

> 'As the printer draws its power from the ZX-81 power supply that has caused problems due to the heavier consumption'

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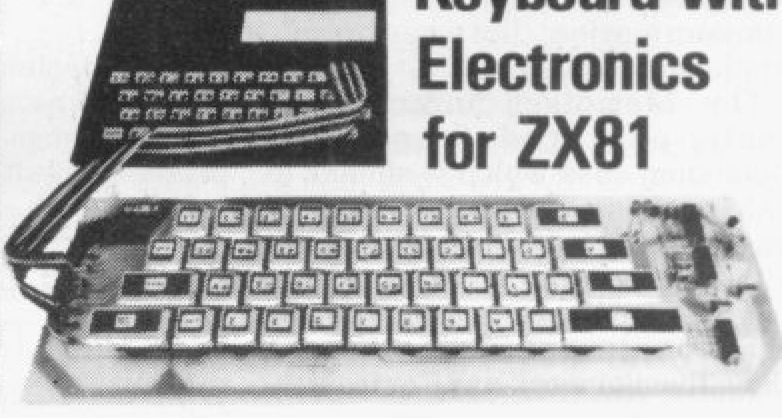
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Nigel Searle looks to the future

Carrying memory in your pocket

IN 1964, as an undergraduate, I saw a computer for the first time. It was an IBM 1620. I spent a good deal of time, much of it late at night, using that machine during the next two years. I realised that the IBM 1620 represented a considerable advance over the technologically primitive computers of the late 1940s and 1950s and I gave some thought to the directions in which future improvements might lead.

I did not imagine, however, that 18 years later a small company called Sinclair Research would have sold more than one million computers and that the biggest-selling model, the ZX-81, would offer computer power similar to that of the IBM 1620 for less than £50. Still less did I imagine that I might be involved in running that company.

Obviously, the 18-year period from 1964 to 1982 has been one of enormous change. Another 18 years will take us to 2000, a suitable target for predictions about the future. What will personal computers be like in 2000? For what will they be used?

If Sinclair Research has anything to do with it, as it intends it should. The personal computer of the future will be small and inexpensive. Sufficiently inexpensive that anyone who has a use for one, and that might be everyone, will be able to afford it. As for size, it will certainly fit in your pocket and it may even be as small as a credit card.

There will be no keyboard. Instead you will communicate with your computer by speaking to it. You may have to adhere more strictly to rules of grammar and pronunciation than in human-to-human speech but even that requirement eventually will disappear and, as Sinclair advertisements for the ZX-81 say, "Inside a day, you'll be talking to it like a friend".

You will also be listening to it like a friend. A principal means of computer-to-human communication will by synthesised speech. It will also employ a flat, colour, high-resolution display to output information in graphic and alphanumeric form.

That small device will have a massive memory containing just about anything you might want to know in the way of general data about the rest of the world, as well as any amount of personal information which you have instructed it to remember for you.

The resident software in your personal computer will enable it to organise its memory so that accurate, rapid retrieval is possible. It will also be able to

> 'You will communicate with your computer by talking to it'

reason — to make logical deductions from what it knows — and also to induce new facts, attempt to verify them, and to assess their plausibility.

In terms of intelligence, it will be human-like but will far surpass the speed and capacity of the human brain. It will lack a body, consciousness and emotion. The latter two might be simulated eventually but why one would want a machine which was, or appeared to be, conscious and have emotions is not clear. On top of that the personal computer of 2000 will also serve as a portable telephone, enabling you to communicate with any other computer owner anywhere in the world.

Perhaps more important, you will be able to talk not just to another person but to his computer; and your computer will be able to communicate directly with his computer, perhaps without either of you being aware you are doing so.

A typical use might go something like this:

Fred to computer: "What time is Bill getting back today?
Computer: "Bill who?"
Fred: "My brother Bill".

Computer searches its memory for information about brother Bill's travel plans for today.

Finding no such information in its memory, Fred's computer sends a message via satellite to Bill's computer, which recognises Fred's code number and gives him access to the semi-private parts of its memory.

Bill has not told his computer when he is travelling, so:
Bill's computer to Fred's: "I don't know; do you want me to ask him?"
Fred's computer: "Yes, please"

These are not spoken but digitally-encoded communications.

I hope *Sinclair User* will let me write a second article in 2000 to review the next 18 years. Perhaps I shall be lying on a beach somewhere and I will just ask my computer to write it.

Nigel Searle is head of the computer division of Sinclair Research.

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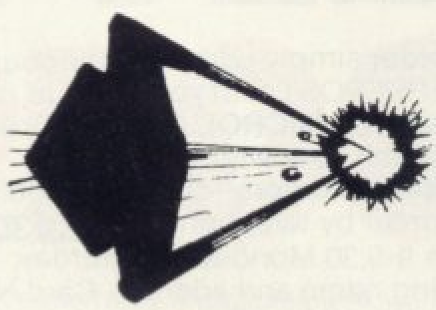
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BUYING a ZX-81 can be the start of a lifetime obsession with home computing. It is easy, however, to become discouraged if everything does not go to plan from the beginning.

For those with only a little knowledge of computers and their capabilities, the best way to approach the ZX-81 is to abandon any ideas for special uses. While the basic machine is ideal for learning how to use computers, it is too small for any major uses. It is better to become accustomed to the many facilities and then decide how you wish to use them.

Begin by unpacking the machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for a second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

Once the K appears you are ready to begin learning about the ZX-81. It can save family arguments if you can afford a separate television set for your system. It also makes life easier if you can find somewhere to leave your equipment set up permanently. You will find that a few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy trailing leads. The manual is written in great detail and is reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something which is important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are really ready but that is likely to lead to errors. For example, words like AND, THEN, and AT should not be typed-in letter by letter. By the time you have reached chapter 11, you should have accumulated sufficient knowledge to be able to type-in other people's programs, such as those in *Sinclair User* and *Sinclair Programs*, without too much difficulty.

It is important that when using the machine it is not jolted. Some of the connections can easily work loose and everything which has been put in will be lost.

The manual is not to everyone's taste and if you find it difficult to follow, a number of books on the market can help you. Find the one which suits you best.

As a way of relaxing, you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy. There are some programs for the unexpanded 1K machine but most of them require a 16K RAM pack. The tapes vary in quality. It is advisable to read the reviews in *Sinclair User* and use your judgment to find the best.

An alternative method to learn about the ZX-81 is to plunge in at the deep end and see what the computer will do. Refer to the manual when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machine.

You may have heard already about the problem involved in SAVEing and LOADing your own cassettes. The manual again gives detailed instructions but many of the early machines would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties.

They usually occur when LOADing tapes recorded by other people. One simple method to overcome this is to wind the tape to the middle of the program and type LOAD" " followed by NEWLINE; then slowly increase the volume of the recorder with the tape running until the television screen shows four or five thick horizontal black bands. If you then re-wind the tape, the program should LOAD normally.

Finally, a health warning. Apart from any practical uses, computing with your ZX-81 can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning, thinking that in another five minutes you will sort out the problem.

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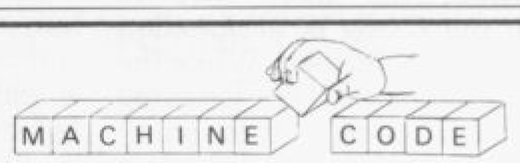
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ZX Spectrum – ZX81

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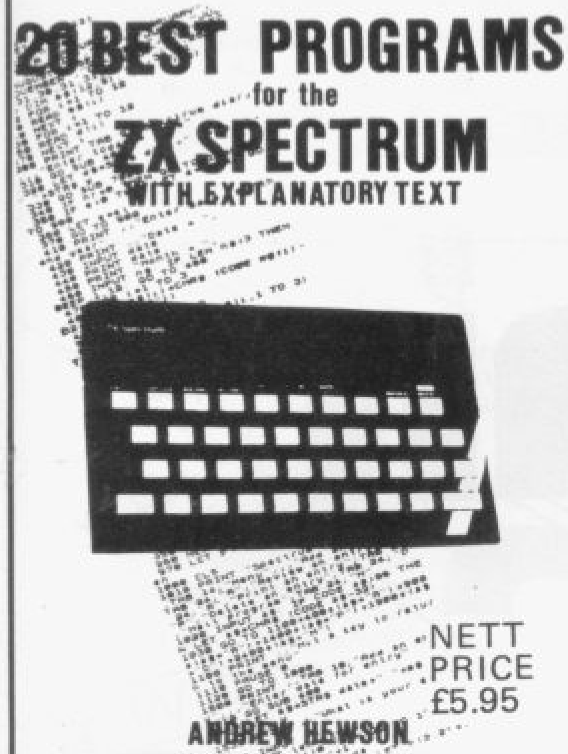
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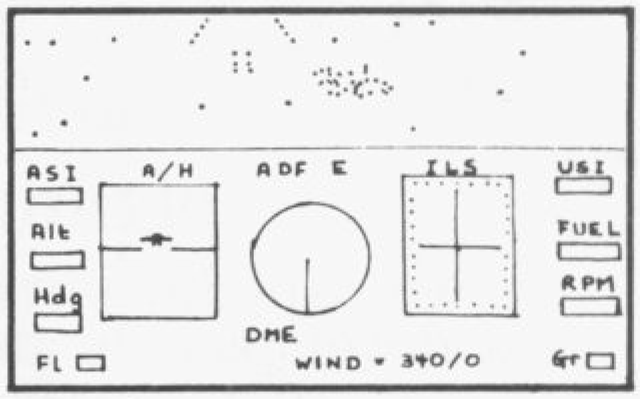
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Home computers are expected to help people. Chris Reynolds has reservations

Code junkies hooked on micros



MANY YOUNGSTERS have home computers because they, or their parents, feel that owning such a computer will help them in their careers. As a university lecturer responsible for training future computer professionals, I have my doubts. Let me explain.

In the last 30 years the uses of computers as part of practical working information systems have mushroomed. For most of that time there has been a desperate shortage of suitably-experienced staff. Salaries rocketed as companies bid to obtain employees with the greatest length of experience, apparently regardless of quality. The whole was surrounded with the prestige of being at the forefront of modern technology, at least in the eyes of one's neighbours.

Much of the gloss has now been shed. There is, of course, still a shortage of good computer professionals but the incompetent now find it almost impossible to climb on the bandwagon, and salaries are no longer so wildly out of line with other occupations. One no longer hears people boasting that they know someone who knows someone who works with computers. In fact, it seems likely that in five years having a computer in the house will be socially as significant as is owning a digital watch today. When acne-embarrassed schoolboys with home computers are ten-a-penny the simple ability to program will have no value in the job market.

Those changes will have a major effect on the structure of the computer profession. The need for highly-skilled people to work on research and development projects in the computer industry will continue. The majority of existing professionals work for companies which use computers as tools to help the company business and it is in that area that the biggest changes will take place. The pressure will be for more flexible and easier-to-use systems with the minimum of fuss.

A prime requirement will be for staff able to communicate with other people, verbally and in writing, with the minimum of jargon. Knowledge of management, economics and psychology, and the design of systems are next on the list. A good understanding of what a computer can reasonably be expected to do is far greater importance than the ability to PEEK and POKE on a particular make of microcomputer.

> 'The pressure will be on for more flexible and easier-to-use systems'

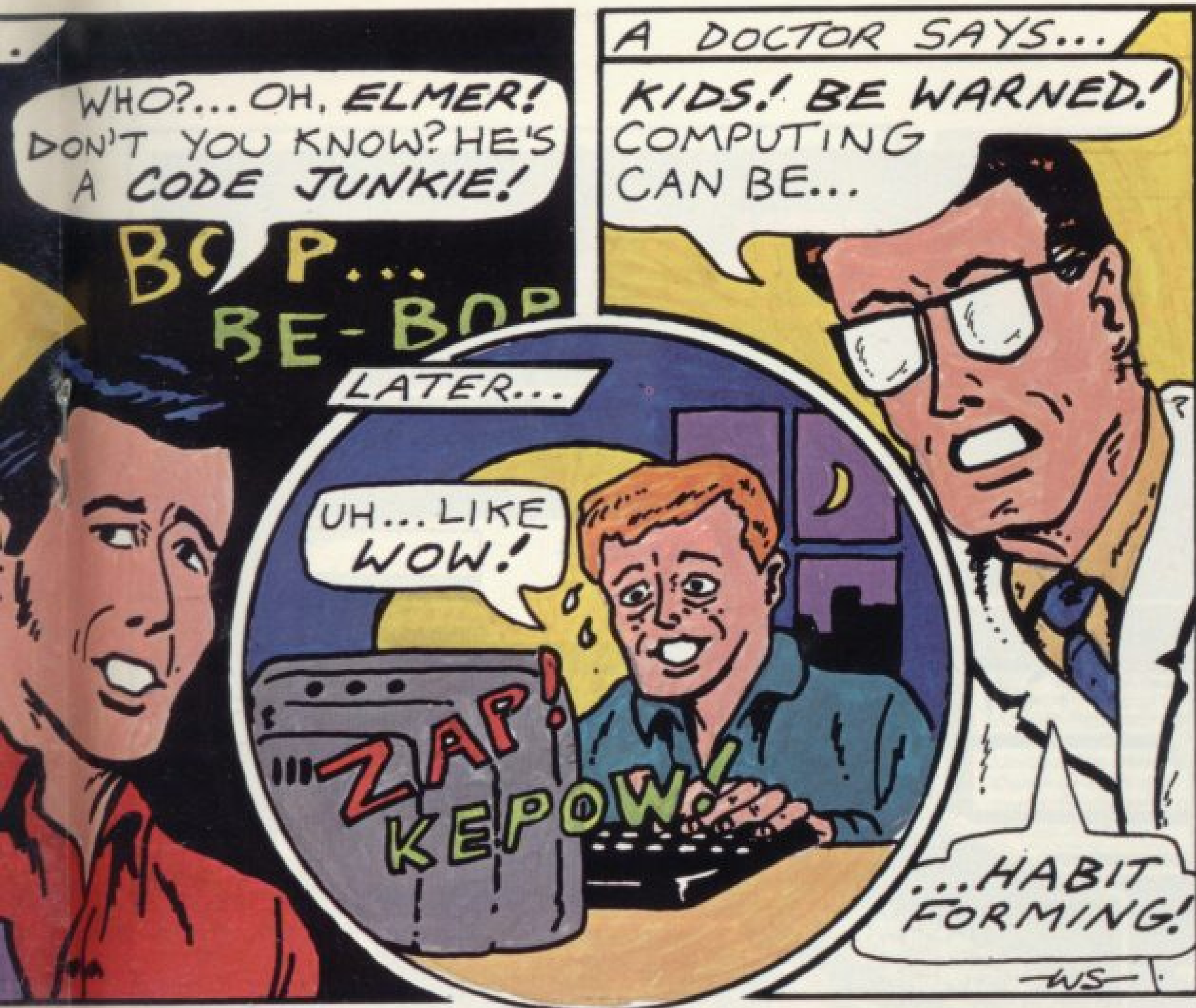
Universities already have moved in that direction and introduced courses which anticipate that future need. For instance, Brunel University has a Systems and Information Management course which has been running for five years and which has attracted 28 good students this year, compared to 22 on its more conventional course. Because it is felt that breadth of experience is important, students who do not have A levels in computer science and mathematics are preferred to those who have already specialised narrowly with double mathematics and computer science.

Many of the leading 21st century computer professionals are now at school and in the light of the foregoing comments, it is useful to speculate what they are doing now. We can be certain that they will be well-acquainted with modern electronics technology. Digital watches and pocket calculators will be taken for granted. Their parents will have television sets with teletext and a variety of electronic games. As soon as they are old enough they will use autobanks and credit cards to buy things such as electronic organs. Even if they never saw a general-purpose computer they would take for granted keys to be pressed, video displays, and automatic informa-tion. processing.

While at school they will almost certainly have been given a computer appreciation course and may have had computer-aided instruction. Most will have taken O and A level computer science. That will not be because this is necessary for their careers but because the education system encourages early specialisation.

Socially, most of them will be good mixers. They are therefore likely to be found in the Boy Scouts, the school band or the local cricket team.

One thing not mentioned is owner-



vellous technology. He is delighted to be allowed to spend many hours every evening enjoying himself in the privacy of his room. Socially, he finds he can boast about his wonderful programs which look most impressive, with flashing screens and perhaps even sound effects.

Because of all this praise and the absence of anyone who can assess the quality of his work properly, he soon becomes convinced that he is a computer genius and spends even more time at the keyboard. He has become a code junkie who craves for his two-hours-a-day session at the keyboard.

In fact, the idea of code junkies is not new. In the last decade we have had several who have become addicted to the university computer. From experience we know that almost all such students fail the course. They prove to be almost unemployable because of their inability to get on well with people, and because of a marked reluctance to work with, rather than play with, computers.

Last year, for the first time, we had the problem of new undergraduates who were already code junkies before they arrived. This year the number of students who have home computers on arrival has more than doubled and it is suspected that many of them will prove to be junkies.

It has been said that home computers and computer games will help to keep the future unemployed occupied in an enjoyable manner. That may well be true in the long term, when society has become adjusted to the new technology. In the short term there is a danger that the majority of the unemployed who play such games will be code junkies who caught the bug during a vulnerable period of adolescence.

ship of a home computer. The reason is that the evidence at Brunel suggests that in many cases a private micro can have an adverse effect on student studies and sometimes on employment prospects.

There are a number of reasons. The first is that to understand and use a language well, you have to be able to think in that language, be it French, Arabic, Pascal or Cobol. Students who have written a large number of programs in a single language, often on a single machine, have difficulty in transferring to other languages.

Gerald Weinberg, in his book *The Psychology of Computer Programming*, showed how easy it was to guess a student's former language by the stylistic errors he makes in learning a new language. Ten years later the problem is much the same. Most novice students learn rapidly the essentials of modern programming concepts, such as block structuring and recursion.

Students who have extensive experience in old-fashioned languages which lack those features often insist on using more powerful high-level languages as if the newer features did not exist. That is apparently because they find it easier to write longer, inelegant programs than to learn something new.

The second problem is that writing programs and playing games on a home computer is most entertaining. The ability to use a home computer is, however, of little relevance to any but the most junior jobs in the computer field. Most adults would discourage a child from wanting to become a television news reader simply because he had built a crystal radio at the age of eleven. Unfortunately computers are so new, and so mysterious to many adults, that most teachers and parents are not sufficiently knowledgeable to recognise a fun hobby as just that and, as a result, they encourage children to attempt to follow a career path for which they may be almost totally unsuited.

> 'The big danger seems to be the bright but socially-gauche adolescent'

The big danger seems to be the bright but socially-gauche adolescent. He finds the school computer more friendly than his school-mates and develops an interest rapidly. A home computer is bought by enthusiastic parents to encourage him in what is certain to be a wonderful career in this mar-

• Dr Chris Reynolds is reader in computer science at Brunel University. He organises the computer science teaching for first-year mathematics computer science students. He also researches improved systems for the man-computer interface.



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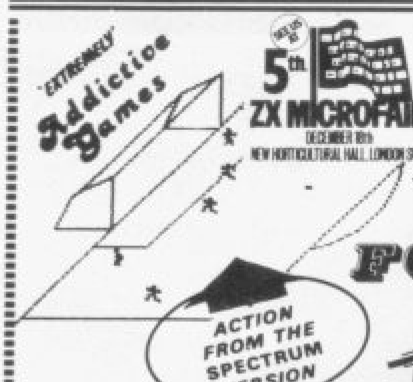
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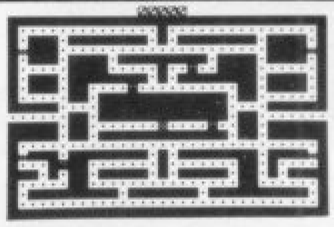
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Sinclair Research opens its Spectrum software library

John Gilbert assesses the new major range of cassettes and finds they do not compare to the machine's qualities

WHEN THE Spectrum was launched, Sinclair stressed that a software library containing business, household and games cassettes would be released soon.

The first batch of tapes was launched at the Personal Computer World Show in September. The launch was billed as one of the great attractions of the show. Spectrum owners were looking forward to putting their machines to good use. Unfortunately, unlike the Spectrum computer, the new tapes are disappointing.

The Spectrum library, with a few exceptions, seems to be a repeat of the ZX-81 range of tapes launched in early 1982. The new software library comprises several sections which include the **Fun to Learn** series, **Pastimes** and **Games.** There are also several cassettes, such as **Bio-rhythms** and **Vu-calc,** which stand alone.

There is a set of five games cassettes. Each contains four 16K games which have been written for Sinclair by ICL.

The games are very simple and it is easy to lose interest in them in a very short time. Several of them, such as **Martian Knockout, Invasion from Jupiter,** and **Galactic Invasion,** are all based on the same principle — guessing the velocity at which you have to fire a laser cannon at a group of marauding aliens.

The game consists of entering the guessed velocity and pressing NEW LINE. That becomes incredibly tedious after the first 10 minutes' play. The rest of the games are either of the Invader, Mastermind or maze types.

Daylight Robbery is not only the phrase which might be used to describe some of the new software but is also on the **Games Three Cassette,** although it has slightly more depth to it than some of the others. The player moves around a maze full of safes. For every safe which can be cracked the player will have the amount of money in it added to the total score.

The only danger encountered with entering the safes is that the player must dodge the guards in the maze. The game is enjoyable for a short time but it plays rather like **Pacman** and is much less addictive.

Of the five games tapes in the series so far, **Games One** seems to be the best value. It contains one of the few games which will last longer than five minutes. **Labyrinth** is an adventure maze game in which the player must fight monsters to find hidden gold in the maze.

> 'Of the five games tapes Games One seems the best value'

Each of the games cassettes costs £4.95, which is somewhat expensive for what they contain. It would have been better to have sacrificed quantity for quality on this occasion. The illustrations on the insert cards are of good quality but people expect better games for the price.

Two of the cassettes in the library mysteriously are labelled **Pastimes** but would have been better-placed in the Games series. They include a Mastermind game called **Secret Code**; a memory game **Kim**; and a puzzle, **Magic Square.**

Magic Square is interesting for a time but soon it becomes just another trivial observation game. The computer displays a square filled with rows of letters of the alphabet in a jumbled sequence. One space in the square is empty. Letters can be shifted around using the blank to place the alphabet in the correct sequence.

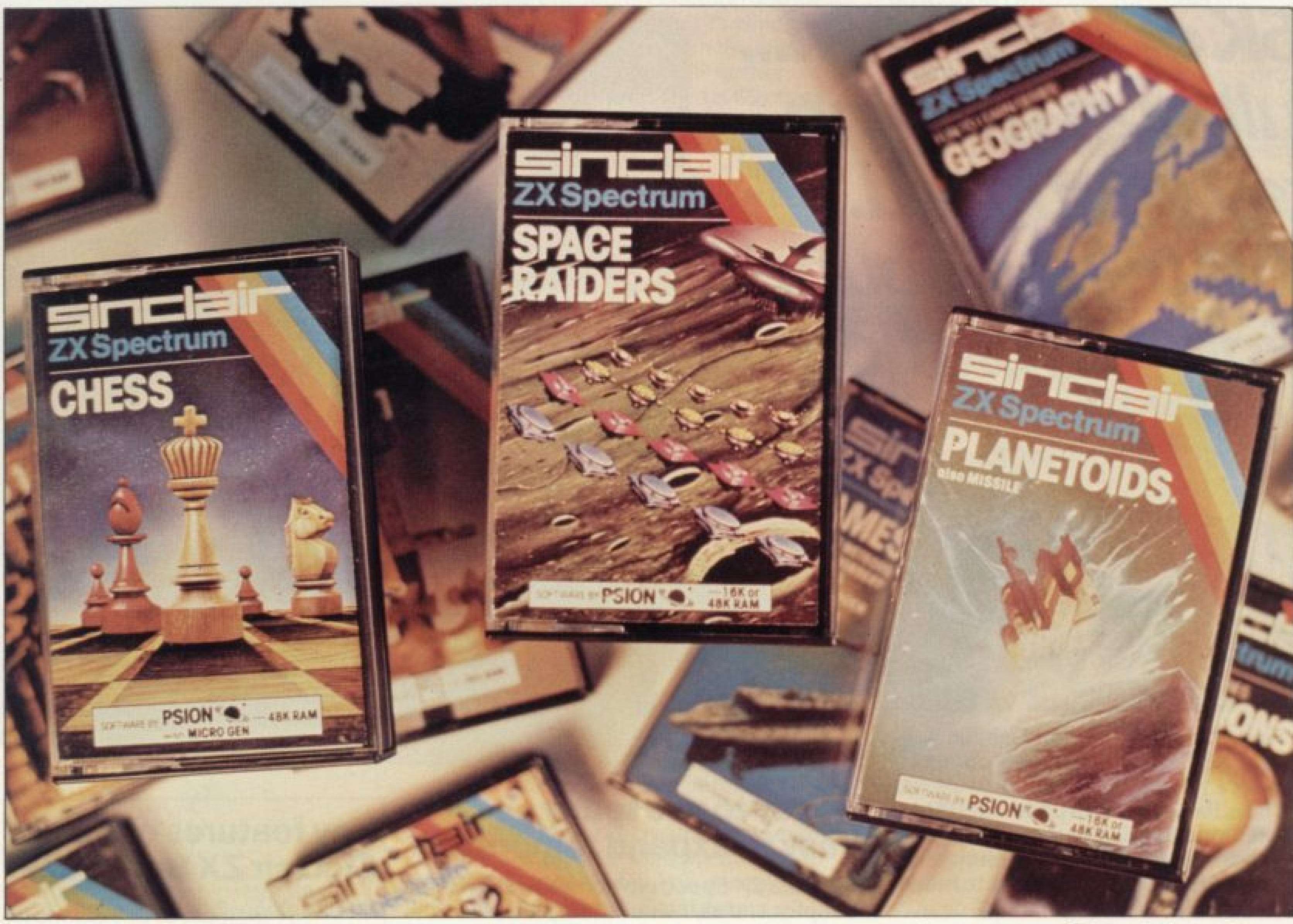
Kim also displays a square but with numbers in it. The numbers disappear one at a time in a random sequence and the player must guess which letter has disappeared each time. Again, the game is interesting but becomes dull and repetitive after a time.

The games on the two cassettes do not warrant the title of Pastimes as they are too repetitive and because of the lack of depth the player may soon begin to feel dissappointed. Pastimes cost £4.95 each.

The Fun to Learn cassettes provide the user with a series of question-and-answer races on various subjects. With only one exception the graphics capabilities and sound facilities of the Spectrum are not used to full advantage. Neither is there a real reward at the end of the tests to induce the user to try again.

The cassette which redeems the whole Fun to Learn series is **Geography.** The computer displays maps labelled with numbers and the user has to guess which numbers correspond to towns and countries displayed below the map.

The idea behind the cassette is good and the map display is



reasonably detailed. The cassettes in the Fun to Learn series are £6.95 each.

The **Bio-rhythms** cassette from ICL is also very good value. The program will plot bio-rhythms and also calculate the critical days for the intellectual, physical and emotional cycles. The graphics are fairly good but the display is confusing when all the cycles are plotted on one graph.

The best cassettes in the range have been produced by Psion. They include **Vu-calc**, **Space Raiders**, **Planetoids** and **Hungry Horace**, a new Pacman-type game.

Space Raiders is an addictive space invaders game. The only thing wrong with it is that it is too easy to achieve a high score. Scores of 10,000 have been reached in less than 10 minutes.

Planetoids is an above-average asteroids game which is very difficult to beat for any length of time. The asteroids are displayed in 3D and the players' ship is easy to move around the screen. The game is more difficult to beat, faster, and much more fun than Space Raiders.

Hungry Horace is an ideal game for young children. It uses the Pacman mould but is a great improvement on the popular arcade game. Horace is a large purple blob with arms and legs. He wanders up and down the maze-like park eating everything in his path and avoiding the guards who try to capture him. He can scare away the guards by ringing the alarm in the maze. If he can reach the exit he enters another sector of the maze and continues to the next exit.

'There are no really outstanding tapes in the series so far'

The game is difficult but after a time a degree of skill can be developed in evading the guards. The mazes become more difficult as the game proceeds and we managed to reach only the third section of the maze. Hungry Horace costs £5.95 and is well worth the money.

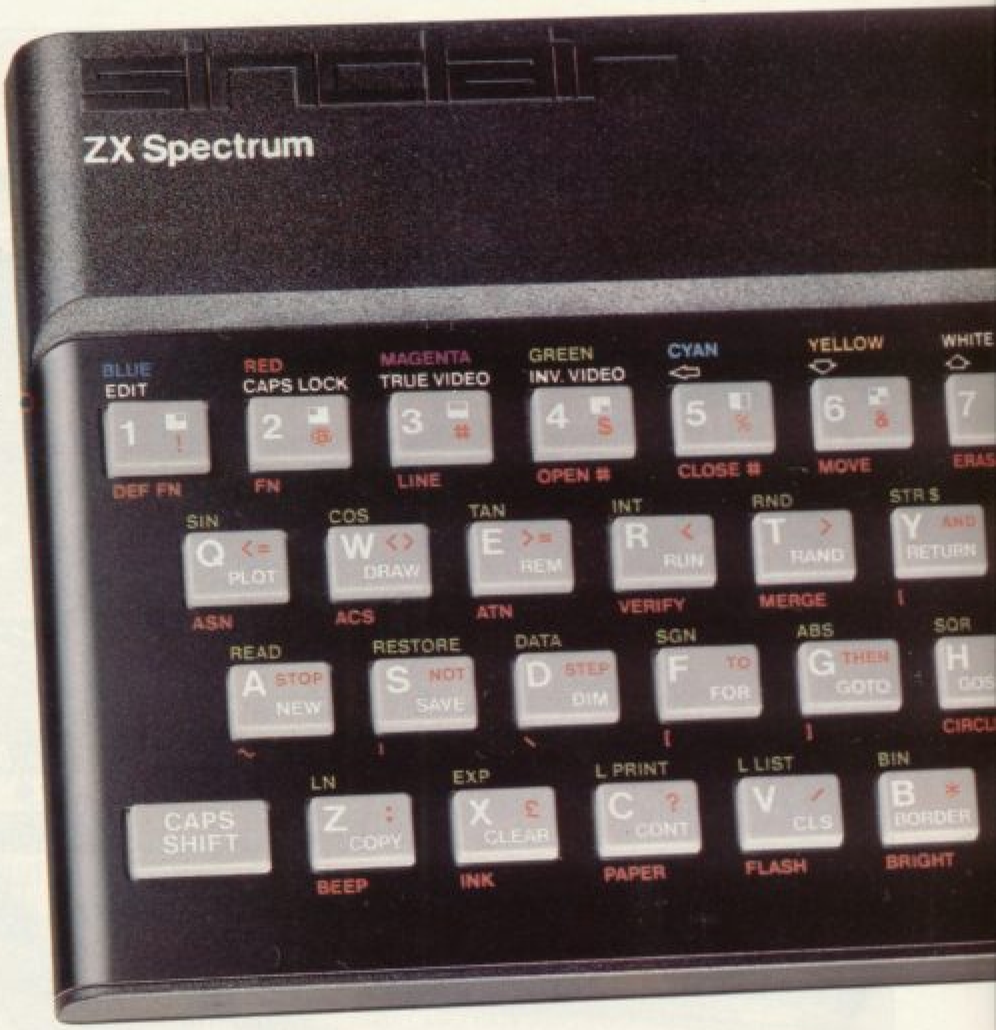
The cassettes in the new Sinclair range can be split into programs which can be played and enjoyed again and again and those with which the user will easily become bored. There are no really outstanding cassettes in the range so far, although Planetoids, Bio-rhythms, Space Raiders and Hungry Horace can be recommended.

Those games have the depth in them to be played for months, while the others may leave the Spectrum owner disappointed. All the cassettes mentioned use 16K memory. Further details about the range can be obtained from Sinclair Research, Camberley, Surrey GI15 3BR.

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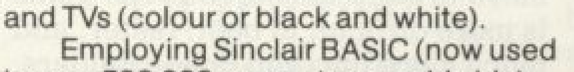
You may decide to begin with the 16K version. If so, you can still return it later for an upgrade. The cost? Around £60.

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Your ZX Spectrum comes with a mains adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white).

Employing Sinclair BASIC (now used in over 500,000 computers worldwide) the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of ZX Spectrum professional-level computing.

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Key features of the Sinclair ZX Spectrum

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- Sinclair 16K extended BASIC – incorporating unique 'one-touch' keyword entry, syntax check, and report codes.

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The ZX Printer – available now

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The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing.

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A remarkable breakthrough at a remarkable price. The Microdrives are available later this year, for around £50.





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This interface, available later this year, will enable you to connect your ZX Spectrum to a whole host of printers, terminals and other computers.

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Power games rule in ancient Greece

THE TYRANT of Athens and Peloponnesian War are two games which take the player into ancient history. Both provide simulations of the Greek way of life.

Tyrant of Athens gives the player the chance to rule the capital of Greece for as many years as the populace allows. Every year the computer asks the player how many troops and ships, allies and food units are required for the year. The money for those items is deducted from the state treasury. Some money should be retained in the royal coffers to pay any invading army you do not want to fight.

There may be many battles during a year and disasters such as lack of money and starvation may occur. The ruler is allowed only three disasters before being deposed. Victory can be achieved within 10 years if you have achieved two-and-a-half times as many victories as defeats and are in a fairly strong position.

Peloponnesian War is similar but is a game of military strategy. The player takes the side of the Athenians, who must beat the Spartan forces. The number of generals and other officers are chosen, the number of warships and the number of ordinary infantry.

Other states may become involved in the war at various times and they would provide extra ships and men. At the beginning of the game none of those states is an ally of either side. The game may develop into a fight to gain the most allies.

The battles may take several years to fight but in the end one decisive battle with Sparta must be fought before 429 BC. If they feel sufficiently confident, the Spartans may enter the final phase after 425 BC but if neither side has committed itself before 404 BC, the final battle phase will be entered automatically.

Both games are available for the 16K ZX-81 and Spectrum from MC Associates, 4 Granby Road, Cheadle Hulme, Cheadle, Cheshire SK8 6LS. Tyrant of Athens costs £6.50 and Peloponnesian War £5.95.

Hanged in colour

A NEW VERSION of Hangman has been produced by Bridge Software. **Lynchmob** was written for both the ZX-81 and Spectrum. The game is for two to six players and the computer takes the role of referee.

The hanging sequence is animated and the large scaffold takes up much of the screen. The graphics quality of the game is good but it is disappointing that one player cannot challenge the computer.



Bridge Software has also introduced a program for which many serious astrologers may have been waiting. **Ephemeris** provides local sidereal times, rising and setting times of the planets and Moon, and distances from Earth.

All the displays can be output to the printer, which is a necessity for this kind of work. Because of that factor and because the program is very user-friendly, it should be of great help to astrologers.

Both programs are produced by Bridge Software, 36 Fernwood, Marple Bridge, Stockport, Cheshire SK6 5BE. Ephemeris costs £6.95 and can be used on the 16K ZX-81. Lynchmob can be obtained for both ZX-81 and Spectrum for £4.95.



Flying the Spectrum

NIGHTFLITE is one of the first flight simulation programs for the Spectrum. At the beginning of the program a series of options is given, including a demonstration flight, take-off, final approach, autopilot and a map of the flight area.

The screen display is split into two, with the aircraft instruments at the bottom and a view through the cockpit window at the top.

The navigational instruments include instrument landing system, artificial horizon, non-directional beacon and VHF omni-directional range.

The program is an accurate simulation, since Hewson Consultants, the company behind the simulation, employed a qualified pilot to provide the technical details.

Nightflite costs £5.95 and is available from Hewson Consultants, 60a St Mary's Street, Wallingford, Oxon OX10 0EL.

Deflecting Silly Sid

SID the Space Invader grew tired of racing around the screen being zapped by lasers. He decided to leave and join a new game from Llamasoft called **Super Deflex**. That



is the way a new game for the 48K Spectrum starts. It may sound silly — but the whole game is silly.

The idea is to bounce Sid around the screen using launch pads so that he hits the number target without being destroyed by laser streaks.

All that may seem simple but this game is not like a simple game of Breakout. The launch pads which are set using the m and n keys on the keyboard will hamper you in the object of hitting the target. They will send Sid in different directions if he hits them.

Any invader who is hit by a laser streak will be buried on the spot and a headstone raised to commemorate the deceased. That causes further problems for other invaders who have to bounce around the screen. If they hit a headstone they will be fried to death and a new invader will appear on the screen.

There are nine levels of difficulty. The first level is easy and the ninth is impossibly difficult. It is difficult to develop much skill in the game but to play it efficiently some kind of skill must be gained.

Super Deflex for the 48K Spectrum can be obtained from Llamasoft Software, Lindon House, The Green, Tadley, Basingstoke, Hampshire for £4.95.

Characters by numbers

NUMEROLOGY has gained as much popularity as Sun sign astrology in the last few years. Several programs calculate the significant numbers of the user's character but the Carnell Software version is one of the best.

The program was written for the ZX-81 and is appealing because of its simplicity of use and the complexity of the answers it gives. The fact that the answers are maddeningly vague and could refer to anyone cannot be blamed on the program.

The instructions with the cassette provide an easy introduction to the 'science' of numbers. After loading the program, the subject types-in name and birth-date. They are then analysed quickly and the results are printed.

The program will appeal to believers and sceptics alike although, while using the game, there was a feeling that it was written tongue in cheek.

Numerology costs £3.50 and can be obtained from Carnell Software, 4 Stainton Road, Slough, Berkshire.

Three games from Firefly

A NEW cassette from Firefly provides a series of 16K games for the Spectrum within one program. The games are selected using a menu which appears at the beginning of the program. All the games on the cassette use the arcade format. They need skill to play but after a few turns the player should develop sufficient expertise to obtain a good score.

There are three games in the program. The first is called **Traft.** The player has to control a little man in a large square. Points are scored every time the player moves as an obstacle is put into a part of the square after every move. If the obstacle hits the player or the player smashes into the obstacle the little man dies. The game is a simple but neat — an original idea.

Star Storm is the second game. It is rather like a poor man's version of Asteroids, where the player's space ship must avoid the stars.

Astro-Run is like Star Storm but with better graphics. The spaceship moves across the screen,

continuied on page 54

JRS Software goes to play

GAMES CASSETTES with a series of games have become more and more popular since Michael Orwin had such a success with his cassettes One to Four. Now JRS has produced a selection of games for the Spectrum on one cassette.

The first game is called **Airport** and is loaded in two parts. Part one is the instructions and part two can be loaded after them. The player is a groundsman at an airport and has to contend with moles digging holes in the runway and trees growing all over the place. The game is hectic and can be confusing at times but it is enjoyable to play and original.

Crabs is like Pacman but much more complicated. It is crabs and not ghosts which chase the player around the maze but the power pills are still the same and so is their effect on the crabs. If you eat a power pill the crabs will run from you. If you manage to catch one your points score is boosted.

Alien takes its plot from the film of the same name. The player has to crawl through the air ducts of the Nostromo spaceship in search of the alien. The only aid the player has is a direction meter. The game quickens in tempo as the alien disappears at any time and can re-appear anywhere. If the monster gets the player the game is finished.



The cassette is well-produced, although Airport is confusing for the player who is also a beginner. **ZX Spectrum Games** is available from JRS Software, 19 Wayside Avenue, Worthing, Sussex BN13 3JU. It costs £4.95.





continued from page 53
trying to dodge the asteroids which seem to appear out of thin air. Again, the idea of the game is good but the presentation could be improved.

On the whole, **Game Tape One** is good but the graphics could be better. The graphics characters are too small for the arcade game effect which Firefly is trying to create.

Games Tape One is available from Firefly, 48 Dorset Street, London W1H 3FH. It costs £4.50.

Success with Star Trek

ANOTHER version of **Star Trek** would have seemed more like a threat than a promise before R and R Software produced its new version of the game for the 48K Spectrum. The company made a great impression with its Spectrum Golf, which has good graphics. This version of Star Trek also has good graphics and transforms the game from a mainframe mediocrity into another great success.

As with Spectrum Golf, the Star Trek game is one of skill. It is more complex than most other versions which have so far been produced.

The computer builds a scenario of Klingons, star bases and stars. It then asks if the player agrees with the scenario. If not, the player can create one.



The star map occupies half the screen and the commands for manoeuvring and scanning are listed. The player can lock into the ship's computer to do navigational calculations, go into hyper-drive, or launch a galaxy-destroying smart bomb. To manoeuvre, operate shields, or fire phasers the player must lock into the control room.

The player can operate a colourful self-destruct sequence if things start to go wrong. That sequence is well-presented and players may blow themselves up deliberately just to watch it.

With the on-screen instructions, the game is easy to play and difficult to beat. It is available from R and R Software, 34 Bourton Road, Gloucester GL4 0LE and is well worth £4.95.

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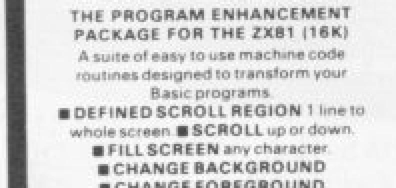
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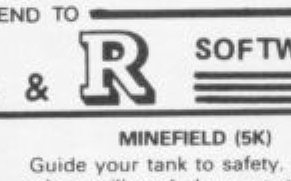
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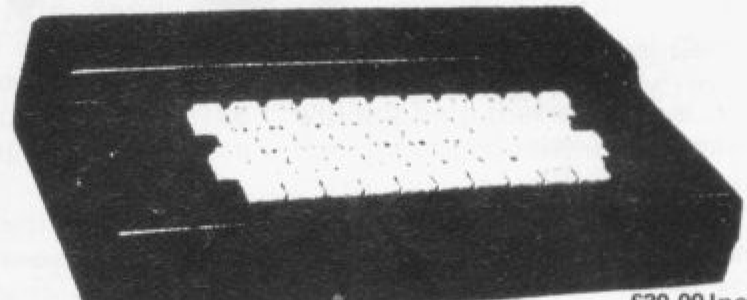
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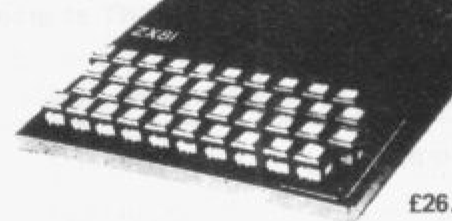
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Eric Deeson does his sums and finds Sinclair's £15 million unlikely to be spent

Education offer 'not as it seems'



A FEW MONTHS ago the British computing press reported a new thrust from Apple into the U.S. education market. I do not think the scheme ever materialised; but the stated intention was that every high school would receive an Apple II free. The press releases mentioned a cost of two hundred million dollars; they were issued at a time when there were strong rumours of a significant drop in Apple sales.

I drew the attention of Sinclair Research to the Apple plan and was interested to hear of its recently-announced scheme to subsidise educational computing in a big way. 'Fine', I thought, but then I began to wonder. Is the scheme as good as it first sounds? If it works, will it help education in any useful long-term way?

It is common knowledge that the Department of Industry has been subsidising the provision of micros to schools. The conditions are restrictive, in particular with only the secondary sector benefitting so far. The aim was, and remains, to support British industry and not to support education. All the same, the scheme has received a cautious welcome from teachers on the grounds that any help, however badly designed, is better than none.

In July, the scheme was extended to cover primary schools, for which the 48K Spectrum was added to the list of approved machines. The Spectrum package — micro, monitor, RS232 interface, cassette recorder, console unit and a little software — is the cheapest of the three available for 50 percent subsidy.

The scheme attracted some criticisms on a number of grounds, though no formal statement appeared from any educational computing group, no doubt because of the summer holidays. In particular, Sinclair fans felt aggrieved that the scheme did not provide a two-Spectrum package plus a printer, still cheaper than the most costly package of the three supported.

Then, in early September, Clive Sinclair stepped in — "£15 million microcomputer scheme for schools" screamed the headline, quoting a figure even greater than the DoI commitment. Schools receiving the DoI Spectrum package will receive from Cambridge a printer, a cassette offering the important system LOGO, and 10 vouchers for later discounts.

There is no need to look the first two gift horses in the mouth; a ZX printer has many good uses in the primary sector, though of course teachers will need to keep a tight rein on paper supply; and LOGO, if it is the promised full implementation, will be highly appreciated.

The vouchers? Valid until the end of 1984 — a year after the DoI scheme closes — each will enable a purchaser to have either a 48K Spectrum for £130 — current prices — or a printer when a 48K is bought at the full price.

So the Sinclair scheme is intended to subsidise the raising of school computing power after the initial DoI splurge. Fair enough; any primary school starting with a micro will need several more in a few years and as the Government will not help there, and neither will the local education authorities, extra power will be difficult to acquire.

It is not easy to appreciate how poverty-stricken primary schools are and their precious resources must go, in the main, on consumables, like writing materials. What is Sinclair expecting of them? Let us work it out.

A primary school head is invited to join the DoI scheme. Can the school afford the half-price package? Perhaps it is also offered further assistance from the local authority, as in Birmingham, which will pay an additional 25 percent. To participate, then, the head will have to find anything from £100 to £400. A Birmingham school is tempted to the cheapest package, that based on a Sinclair. A jumble sale will raise the £100 needed to buy a very good computing package and 10 vouchers.

'His scheme will increase number of schools opting for the ZX. That is good for schools as other machines are less suitable'

Next year, staff, pupils and parents request a second computer. They have no chance if they did not opt for Sinclair, for both the other packages are more costly and offer

continued on page 58







continued from page 57

no vouchers. A second 48K Spectrum and a second-hand black and white TV set will cost £160 and one voucher. A bigger jumble sale is needed and still nine vouchers in hand.

The £15 million in the Sinclair headline assumes that every one of the 28,000 primary schools in the country opts for Sinclair and uses its 10 vouchers to bring its computer facilities up to 11 Spectrums. What will that cost the school? Ten subsidised Spectrums, £1,300, and 10 old TV sets, £300. That is £1,600 in two years and very few primaries could consider that. Not sufficient power points for a start and I have not counted extra tape recorders, some Microdrives, cassettes, software, books, and perhaps network facilities, taking the total past £2,000.

So Clive's money is safe. His scheme will increase the number of schools opting for the ZX package; that is good for the schools, as the other machines — BBC and 480-Z — are far less suitable; and good for Sinclair.

Perhaps 10,000 schools may take the Sinclair with the DoI scheme. They may, on average, use one more voucher each. So Sinclair Research will be subsidising education to the extent of perhaps £1.5 million. That is not be sneezed at and will be money well spent, in Sinclair's view.

Shall we pretend there is £13.5 million left in the kitty? What should Sinclair do with that? Here are some ideas:

- Donate a second complete 48K Spectrum package to 3,500 primary schools each year, if they prove through some competition or other that they could use it. Cost, £3 million to end 1984.
- Donate a Spectrum to the, 5,000 runners-up each year — £2 million.
- Organise and pay for a series of superb weekend courses on using the Spectrum in the primary school — say nine a year each for 500 people costing £1 million.
- Invest £1 million in an educational ZX software publishing company.

My dream is a micro for every pupil and Sinclair Research is the only company in the West likely to make it come true.

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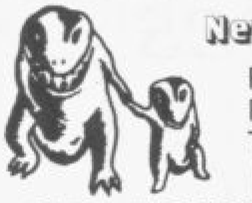
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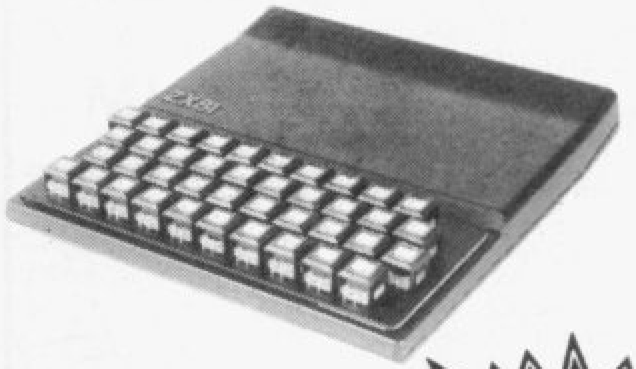
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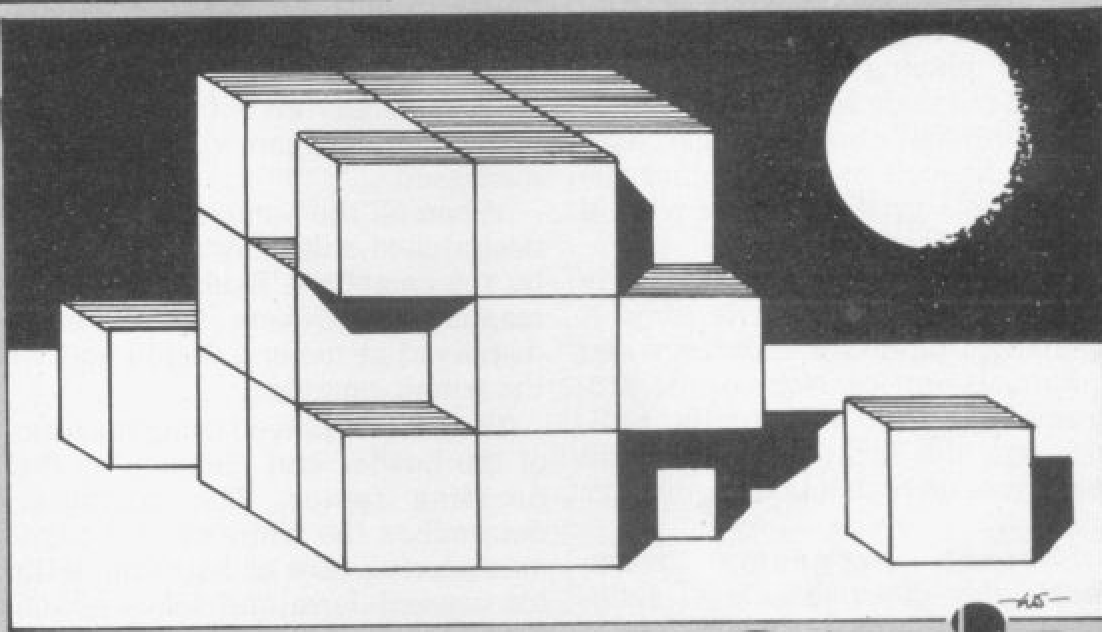
SUA12

PROGRAM PRINTOUT

HAMPSON'S PLANE for the 16K ZX-81 is derived from an attempt to simulate in two dimensions as many features of Rubic's Cube as possible. The author of the listing, I Turtle of Scunthorpe, South Humberside, discovered the basic idea from an article in an American magazine.

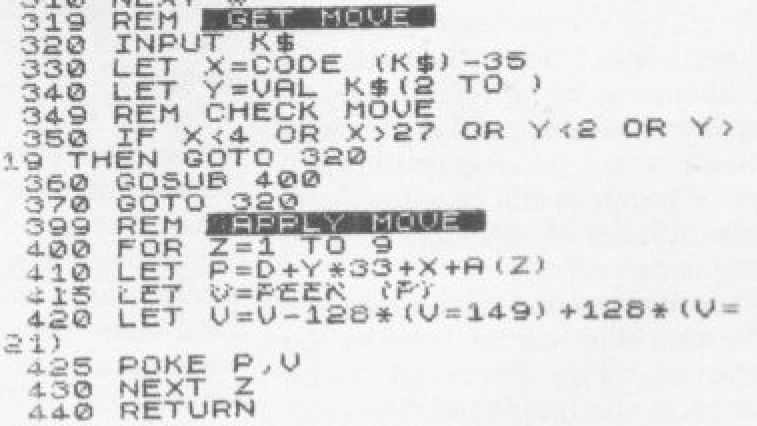
The rules of the game are fairly simple. The screen is covered by 20 lines of plus signs. The computer, running in FAST, selects one of the symbols at random and inverts it and its eight immediate neighbours. The process is repeated a number of times, depending on the skill level.

When the computer has finished, your job is to convert the screen to normal, using the same technique, i.e., defining the centre square of a group and ordering the machine to invert it and its neighbours. The move should be input as "Letter, number, NEWLINE".



HAMPSON'S PLANE

```
   1 REM
   2 REM        HAMPSON""S PLANE
   3 REM
   4 REM
   9 REM  INITIALIZE
  10 PRINT TAB 7;"HAMPSON""S PLA
NE"
  20 PRINT
  30 PRINT "ENTER SKILL LEVEL"
  40 INPUT S
  50 CLS
  60 PRINT "   ABCDEFGHIJKLMNOPQR
STUVWXYZ"
  70 FOR Z=1 TO 20
  80 IF Z<10 THEN PRINT " ";
  90 PRINT Z;"++++++++++++++++++
++++++++";Z
 100 NEXT Z
 101 PRINT "   ABCDEFGHIJKLMNOPQR
STUVWXYZ"
 103 FOR W=1 TO 1
 106 NEXT W
 110 LET D=0
 120 LET P=0
 125 LET V=0
 130 LET X=0
 140 LET Y=0
 150 DIM K$(3)
 160 DIM A(9)
 170 LET A(1)=-34
 180 LET A(2)=-33
 190 LET A(3)=-32
 200 LET A(4)=-1
 210 LET A(5)=0
 220 LET A(6)=1
 230 LET A(7)=32
 240 LET A(8)=33
 250 LET A(9)=34
 259 REM  DISPLAY FILE
 260 LET D=PEEK 16396+256*PEEK 1
6397
 265 RAND
 269 REM  SCRAMBLE BOARD
 270 FOR W=1 TO S
 280 LET X=INT (RND*24)+4
 290 LET Y=INT (RND*18)+2
 300 GOSUB 400
 310 NEXT W
 319 REM  GET MOVE
 320 INPUT K$
 330 LET X=CODE (K$)-35
 340 LET Y=VAL K$(2 TO )
 349 REM CHECK MOVE
 350 IF X<4 OR X>27 OR Y<2 OR Y>
19 THEN GOTO 320
 360 GOSUB 400
 370 GOTO 320
 399 REM  APPLY MOVE
 400 FOR Z=1 TO 9
 410 LET P=D+Y*33+X+A(Z)
 415 LET V=PEEK (P)
 420 LET V=V-128*(V=149)+128*(V=
21)
 425 POKE P,V
 430 NEXT Z
 440 RETURN
```



CRICKET

CRICKET and summer go together, so for the summer competition *Sinclair User* asked for a cricket simulation program. The response was varied. Some people designed programs with good graphics and others decided to concentrate more on the laws of the game.

Many of the programs went some way to playing a good game of cricket but none seemed to produce complete simulations. In some cases it was difficult to tell whether the author of a program knew what a computer simulation was.

The simulation needed to be fairly logical in its approach to play. It needed to cater for incorrect and ridiculous entries. None of the programs did that sufficiently well, although the task is possible and there was no restriction on memory size.

Several programs were reasonably close to a good simulation and the best of them was a limited-overs game by Peter Horlock, of Godalming, Surrey.

His program simulated a game of two innings between Surrey and Middlesex, each team consisting of ten players. At the beginning of the game the players are asked to choose sides and the toss is made to decide who bats.

The player whose team is fielding is shown a list of men in the team and may choose a bowler from any of them, except the wicketkeeper, who is shown by an " = ". Alongside each player's name is his bowling form and the number of overs he can bowl during the game.

When the bowling side is set up, the batting side will be listed by the computer. The form of each batsman is also displayed. The computer will choose the two batsmen who are to play next and ask the batting player to enter their form, which is usually a number between one and 20.

When bowling and batting form have been entered, the computer will decide the outcome of a delivery. The batsman could be run out, caught, or leg before. The bowler could bowl a wide or one of the fielders could miss a catch.

Several times during the game the computer will ask whether the players want an analysis of play so far. The batting or bowling figures can be obtained in that way for both sides. The bowling table shows the number of overs, maidens, runs, and wickets for each bowler. It will also show the name of the present bowler, the number of overs so far played, and the number of deliveries in the current over.

The batting analysis shows the names of players who have batted, the number of runs scored by each, and whether they are out. It also displays the total runs obtained and the number of batsmen who have been dismissed.

When all the batsmen have been despatched, the teams are switched by the computer. Each team has a maximum of 20 overs. The winner is displayed at the end with a note of the winning margin.

The game is played using the form of the bowler and batsmen as the deciding factor. The computer determines the chances of a batsman scoring runs or being out with his present form and takes action accordingly.

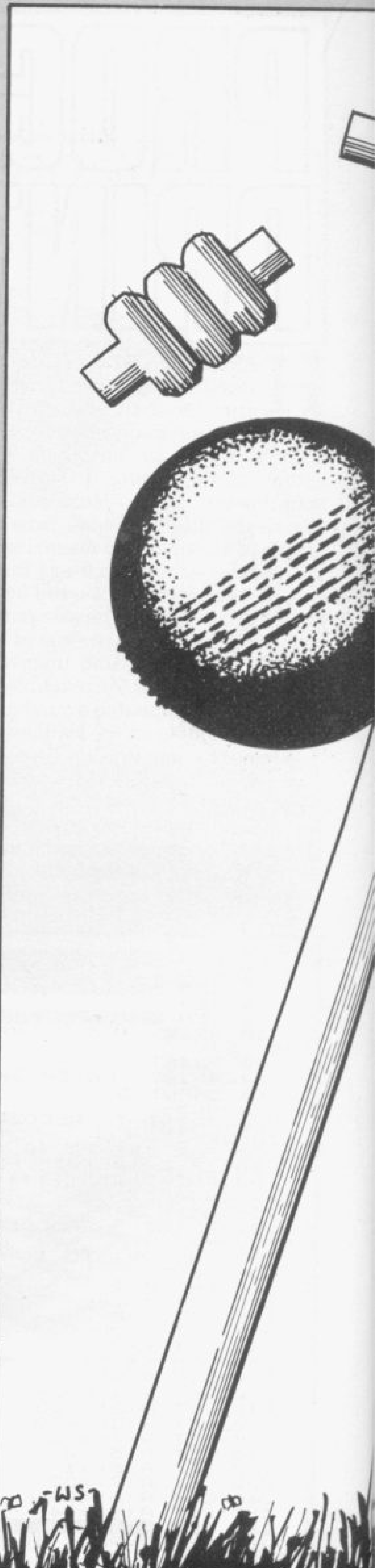
Horlock needed a few weeks to write the game. He bought his ZX-81 in February and uses it mainly for sports-orientated and intellectual programs. He says:

"I have a ZX-81 version of chess which interests me and I also have a football pools prediction program. The football program takes into account all four divisions of the league".

He is very interested in computers and writes many programs. He was introduced to the ZX-81 last Christmas by a friend in the roofing department of a local firm where he works. He is not a member of any local user group but many of his workmates are also interested in Sinclair computers.

His reasons for entering the competition were for pleasure and practical necessity. He said: "The subject matter interested me and I decided to write the program. The printer I bought with my ZX-81 broke down and I returned it to Sinclair. In the meantime I thought I might be able to win another one in the competition."

The limited-overs cricket program uses much less than 16K of memory. Horlock has written an upgrade of the program which fills the remaining space. The program allows one player to play a game against the computer.







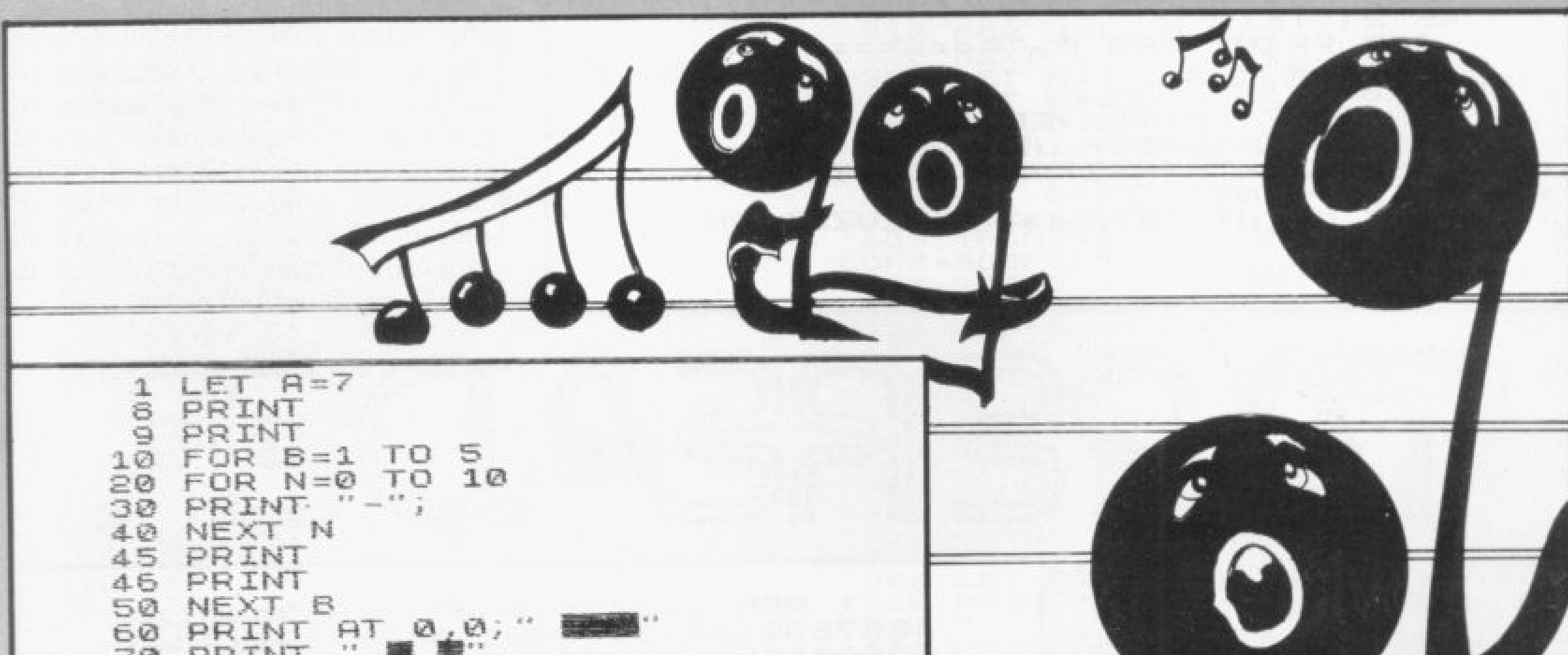
```
   1 REM "CRICKET" BY PETER J.
HORLOCK 15/10/82
   5 LET C=0
  10 LET D=1
  15 LET E=2
  20 DIM A$(E,11,8)
  30 DIM B$(E,11,E,4)
  40 DIM E(E)
  50 DIM W(E)
  60 DIM F(E,5)
  70 DIM O(E)
  75 DIM P(E)
  80 DIM B(11)
  90 RAND
  95 LET L=C
  98 LET K=0
 100 LET IN=D
 105 LET ZX=C
 110 DIM C$(E,8)
 120 DIM F$(E,9)
 125 DIM H$(E,20)
 130 DIM E$(E,9)
 135 DIM G$(E,10)
 140 DIM D(E)
 150 DIM C(E)
 160 LET NB=C
 170 LET WI=C
 175 LET LB=C
 180 LET BY=C
 190 LET E$(D)="SURREY"
 200 LET E$(E)="MIDDLESEX"
 210 LET A$(D,D)="BUTCHER"
 220 LET A$(D,E)="HOWARTH"
 230 LET A$(D,3)="SMITH"
 240 LET A$(D,4)="LYNCH"
 250 LET A$(D,5)="KNIGHT"
 260 LET A$(D,6)="RICHARDS"
 270 LET A$(D,7)="ROOPE"
 280 LET A$(D.8)="THOMAS"
 290 LET A$(D,9)="PAYNE"
 300 LET A$(D,10)="CLARKE"
 310 LET A$(D,11)="JACKMAN"
 320 LET A$(E,D)="BREARLEY"
 330 LET A$(E,E)="SLACK"
 340 LET A$(E,3)="RADLEY"
 350 LET A$(E,4)="BARLOW"
 360 LET A$(E,5)="GATTING"
 370 LET A$(E,6)="DOWNTON"
 380 LET A$(E,7)="EMBUREY"
 390 LET A$(E,8)="EDMONDS"
 400 LET A$(E,9)="COWANS"
 410 LET A$(E,10)="SELVEY"
 420 LET A$(E,11)="DANIEL"
 500 PRINT "HOW MANY PLAYERS, 1
OR 2 ?"
 510 INPUT X
 520 IF X<>D AND X<>E THEN GOTO
510
 530 CLS
 540 IF X=E THEN GOTO 600
 550 PRINT "CHOOSE YOUR LEVEL, 1
TO 9"
 560 INPUT L
 570 IF L<D OR L>9 THEN GOTO 560
 580 CLS
 600 PRINT TAB 3;"LIMITED OVER C
RICKET MATCH"
 610 PRINT ,,TAB 10;"FOR ";X;" P
LAYER";("S" AND X=E)
 620 PRINT ,,TAB 8;"20 OVERS EAC
H SIDE"
 630 PRINT ,,TAB 6;E$(D);"V";TAB
 18;E$(E),,,
 640 FOR Z=D TO 11
 650 PRINT TAB 3-LEN STR$ Z;Z;TA
B 6;A$(D,Z);TAB 18;A$(E,Z)
 660 NEXT Z
 670 IF X=E THEN GOTO 1070
 680 PRINT ,,"CHOOSE YOUR TEAM",
"""S"" = SURREY, ""M"" = MIDDLES
EX"
 690 INPUT Z$
 700 IF Z$<>"S" AND Z$<>"M" THEN
 GOTO 690
 710 CLS
 715 LET ZX=D+(Z$="S")
 720 IF Z$="M" THEN GOTO 1120
 730 IF RND<.5 THEN GOTO 1000
 740 PRINT E$(ZX);" HAVE WON THE
 TOSS"
 750 IF RND<.5 THEN GOTO 800
 760 PRINT ,," AND WILL ";("BAT"
 AND ZX=2)+("FIELD" AND ZX=1);"
 FIRST"
 770 INPUT Z$
 780 CLS
 790 GOTO 1550
 800 PRINT ,," AND WILL ";("BAT"
 AND ZX=D)+("FIELD" AND ZX=E);"
FIRST"
 810 INPUT Z$
 820 CLS
 830 GOTO 1500
1000 PRINT "SURREY HAVE WON THE
TOSS",,,
1010 GOTO 1230
1070 PRINT ,,TAB 3;"PLAYERS CHOO
SE YOUR TEAMS"
1100 INPUT Z$
1110 CLS
1120 PRINT TAB 9;"THE TOSS"
1130 PRINT AT 6,9;E$(E)
1140 PRINT ,,TAB 6;"ENTER ""H""(
HEADS)";TAB 9;" OR ""T""(TAILS)"
1150 INPUT Z$
1160 CLS
1170 IF Z$<>"H" AND Z$<>"T" THEN
 GOTO 1120
1200 LET X=RND
1210 IF (Z$="H" AND X<.5) OR (Z$
="T" AND X>=.5) THEN GOTO 1300
1220 PRINT "TOSS = ";("HEADS" AN
D Z$="T")+("TAILS" AND Z$="H")
1222 PRINT ,,
1225 IF ZX=D THEN GOTO 740
1230 PRINT E$(D);" ENTER ""B""(T
O BAT)"
1240 PRINT TAB 13;" OR ""F""(TO
FIELD)"
1250 INPUT Z$
1260 CLS
1270 IF Z$="B" THEN GOTO 1500
1280 IF Z$="F" THEN GOTO 1550
1290 GOTO 1230
1300 PRINT "TOSS = ";("HEADS" AN
D Z$="H")+("TAILS" AND Z$="T")
1310 PRINT ,,E$(E);" ENTER ""B""
(TO BAT)"
1320 PRINT TAB 13;" OR ""F""(TO
FIELD)"
1330 INPUT Z$
1340 CLS
1350 IF Z$="F" THEN GOTO 1500
1360 IF Z$="B" THEN GOTO 1550
1370 GOTO 1310
1500 LET B=D
1510 LET F=E
1520 GOTO 1600
1550 LET B=E
1560 LET F=D
1600 FOR Z=D TO 11
1630 IF Z<>6 THEN LET B(Z)=4
1640 NEXT Z
1650 LET G=D
1660 IF ZX=F THEN LET K=L-5
1670 IF ZX=B THEN LET K=5-L
1900 LET B$(B,D,D,D)="█"
1910 LET B$(B,E,D,D)="█"
1980 LET MA=C
2010 LET B1=C
2020 LET B2=C
2030 LET C$(D)=A$(B,D)
2040 LET C$(E)=A$(B,E)
2070 LET C(D)=D
2080 LET C(E)=E
2090 LET NXB=3
2100 GOSUB 9900
2110 PRINT ,,,," TO SEE ANALYSIS
 ENTER ""A"""
2150 INPUT Z$
2160 CLS
2170 IF Z$="A" THEN GOSUB 7900
2180 IF D(D)=C THEN GOTO 2240
2185 IF ZX=F THEN GOTO 8540
2190 GOSUB 9900
2195 PRINT ,,,D$,,"IS DUE TO BO
WL HIS OVER NO. ";5-B(D(D)),"DO
YOU WISH TO CHANGE THE BOWLER"
2200 PRINT ,,E$(F),,"ENTER ""Y""
 OR ""N"""
2210 INPUT Z$
2215 IF Z$<>"Y" AND Z$<>"N" THEN
 GOTO 2210
2220 CLS
2230 IF Z$="N" THEN GOTO 2300
2240 IF ZX=F THEN GOTO 8550
2250 GOSUB 9700
2260 FOR Z=D TO G
2270 IF CODE G$(F,Z)=D(D) THEN G
OTO 2300
2280 NEXT Z
2285 LET G$(F,G)=CHR$ (D(D))
2290 LET G=G+D
2300 LET P(B)=P(B)+D
2305 LET X1=D(D)+9
2310 IF ZX=F THEN GOTO 8500
2320 GOSUB 9900
2330 GOSUB 9600
2340 PRINT ,,E$(F),,"ENTER YOUR
BOWLING POWER"
2350 PRINT ,,"MAX = ";X1,,"MIN =
 1"
2360 INPUT F1
2370 IF F1>X1 OR F1<1 THEN GOTO
2360
2380 CLS
2400 LET X2=21-C(D)
2410 IF ZX=B THEN GOTO 8520
2420 GOSUB 9900
2430 GOSUB 9600
2440 PRINT ,,D$;" POWER = ";F1;"
 (MAX = ";X1;")",
2450 PRINT ,,E$(B),,"ENTER YOUR
BATTING POWER"
2460 PRINT ,,"MAX = ";X2,,"MIN =
 1"
2470 INPUT F2
2480 IF F2>X2 OR F2<1 THEN GOTO
2470
2490 CLS
2500 LET T=100
2505 IF RND>.05*F1/X1 THEN GOTO
3000
2510 LET P(B)=P(B)-D
2520 IF RND<.5 THEN GOTO 2600
2550 PRINT "NO BALL"
2560 LET NB=D
2565 LET T=150
2570 GOTO 3000
2600 LET X=RND
2610 LET WI=D+(X>.8)+(X>.83)+(X>
.85)
2615 IF IN=E AND WI<4 AND WI+E(B
)>E(F)+D THEN LET WI=E(F)+D-E(B)
2620 PRINT WI;" WIDE"+("S" AND W
I>D)
2630 IF WI=D AND RND<.95 THEN GO
TO 4510
2635 IF WI<>D AND WI<>3 THEN GOT
O 4510
2640 IF WI=D THEN PRINT ,,"BATSM
EN CROSSED"
2650 GOSUB 9500
2690 GOTO 4510
3000 LET X=RND
3010 LET Z=F1/80*(20+O(B))/40
3020 IF X<Z+K/16*Z THEN GOTO 320
0
3030 IF X>.9-.7*F1/X1*(20+O(B))/
40 THEN GOTO 3400
3040 GOTO 3300
3200 LET X=RND
3210 LET Y=F2/X2+K/16*F2/X2
3250 IF X<.2+Y*.6 THEN GOTO 3500
3260 IF X>D-F2*.01 THEN GOTO 400
0
3270 GOTO 4500
3300 LET X=RND
3310 LET Y=F2/X2+K/16*F2/X2
3350 IF X<Y*.1 THEN GOTO 3500
3360 IF X>.85-F2*.03*(40+O(B))/6
0 THEN GOTO 4000
```

```
3370 GOTO 4500
3400 LET X=RND
3410 LET Y=F2/X2+K/16*F2/X2
3450 IF X<Y*.02 THEN GOTO 3500
3460 IF X>.65-F2*.04+(60+O(B))/8
0 THEN GOTO 4000
3470 GOTO 4500
3500 LET X=RND
3502 IF NB=D THEN GOTO 4500
3505 LET R=C
3507 IF NXB<12 THEN LET B$(B,NXB
,D,D)="■"
3510 IF X<.45 THEN GOTO 3600
3520 IF X<.71 THEN GOTO 3700
3530 IF X<.97 THEN GOTO 3800
3540 IF X<.99 THEN GOTO 3900
3550 PRINT C$(D);" [illegible] ■";D$
;TAB 29;B1
3560 LET B$(B,C(D),D,D)="■"
3570 GOTO 3920
3600 LET X=INT (RND*13)
3610 IF X=C OR X=12 THEN LET X=6
3620 PRINT C$(D);"■";(A$(F,X) AN
D X<>D(D));("     AND     " AND X=D(D
));"■";D$;TAB 29;B1
3630 LET B$(B,C(D),D,D)="■"
3635 LET B$(B,C(D),D,E)=CHR$ X
3637 LET B$(B,C(D),D,3)=CHR$ D(1
)
3640 LET B$(B,C(D),D,4)=CHR$ B1
3645 IF W(B)=9 THEN GOTO 3950
3650 IF RND<.7 THEN GOTO 3680
3652 PRINT ,,"BATSMEN CROSSED"
3655 LET C(D)=C(E)
3660 LET C(E)=NXB
3662 LET C$(E)=A$(B,C(E))
3665 LET B1=B2
3670 LET B2=C
3675 GOTO 3690
3680 LET C(D)=NXB
3685 LET B1=C
3690 GOTO 3950
3700 PRINT C$(D);TAB 17;"■";D$;T
AB 29;B1
3710 LET B$(B,C(D),D,D)="■"
3750 GOTO 3920
3800 PRINT C$(D);"  [illegible] ■";D$
;TAB 29;B1
3810 LET B$(B,C(D),D,D)="■"
3850 GOTO 3920
3900 PRINT C$(D);"■";A$(F,6);"■"
;D$;TAB 29;B1
3910 LET B$(B,C(D),D,D)="■"
3920 LET B$(B,C(D),D,3)=CHR$ D(1
)
3925 LET B$(B,C(D),D,4)=CHR$ B1
3930 LET C(D)=NXB
3940 LET B1=C
3950 LET B$(F,D(D),E,4)=CHR$ (CO
DE B$(F,D(D),E,4)+D)
3955 LET W(B)=W(B)+D
3960 IF W(B)=10 THEN GOTO 6900
3965 LET F$(B,W(B))=CHR$ E(B)
3970 LET C$(D)=A$(B,C(D))
3980 LET NXB=NXB+D
3985 LET T=T+E
3990 GOTO 4600
4000 LET X=RND
4010 LET Y=(20+O(B))/40
4020 LET Z=F2/X2
4030■LET A=F1/X1
4040 LET R=D+(X>D-.15*Z-.15*A-.6
*Y)+(X>D-.1*Z-.1*A-.45*Y)+(X>D-.
08*Z-.08*A-.4*Y)+(E AND X>D-.03*
Z-.03*A-.03*Y)
4045 IF RND<(6-R)/100 THEN GOTO
9000
4050 IF R>=4 THEN GOTO 4300
4055 IF IN=E AND E(B)+R>E(F)+D T
HEN GOTO 9200
4060 IF RND>F2/X2*.04*(20+O(B))/
40 THEN GOTO 4300
4065 LET R=R-D
4070 LET W(B)=W(B)+D
4080 LET B1=B1+R
4085 IF NXB<12 THEN LET B$(B,NXB
,D,D)="■"
4088 PRINT C$(D);" HAS SCORED ";
R;" RUN";("S" AND R<>D)
4090 IF RND<.5 THEN GOTO 4200
4100 PRINT ,,C$(D);"       RUN
OUT";TAB 29;B1
4110 LET B$(B,C(D),D,D)="■"
4120 PRINT ,,"RUN OUT GOING FOR
";R+D;" RUN";("S" AND R>C)
4130 LET B$(B,C(D),D,4)=CHR$ B1
4135 IF W(B)=10 THEN GOTO 4340
4140 LET C(D)=NXB
4145 LET C$(D)=A$(B,C(D))
4150 LET B1=C
4160 GOTO 4260
4200 PRINT ,,C$(E);"       RUN
OUT",TAB 29;B2
4210 LET B$(B,C(E),D,D)="■"
4220 PRINT ,,"RUN OUT GOING FOR
";R+D;" RUN";("S" AND R>C)
4230 LET B$(B,C(D),D,4)=CHR$ B1
4235 IF W(B)=10 THEN GOTO 4340
4240 LET C(E)=NXB
4245 LET C$(E)=A$(B,C(E))
4250 LET B2=C
4260 LET NXB=NXB+D
4270 LET F$(B,W(B))=CHR$ (E(B)+R
+NB)
4280 IF R<>D THEN GOSUB 9500
4285 LET T=T+150
4290 GOTO 4340
4300 LET B1=B1+R
4320 PRINT C$(D);" HAS SCORED ";
R;" RUN";("S" AND R>D)
4325 LET B$(B,C(D),D,4)=CHR$ B1
4330 IF R=D OR R=3 THEN GOSUB 95
00
4340 IF R>C THEN LET NB=C
4350 LET E(B)=E(B)+R+NB
4360 LET B$(F,D(D),E,3)=CHR$ (CO
DE B$(F,D(D),E,3)+R)
4370 IF W(B)=10 OR (IN=E AND E(B
)>E(F)) THEN GOTO 6900
4400 GOTO 4600
4500 PRINT "NO RUNS SCORED OR WI
CKETS LOST"
4510 LET R=C
4520 LET E(B)=E(B)+NB+WI
4512 IF R=C AND NB=C AND WI=C TH
EN LET MA=MA+D
4620 LET F(B,D)=F(B,D)+NB
4630 LET NB=C
4640 LET F(B,E)=F(B,E)+WI
4650 LET WI=C
4660 LET F(B,5)=F(B,5)+F(B,E)+F(
B,3)+F(B,4)
4670 IF IN=E AND E(B)>E(F) THEN
GOTO 6900
4700 PAUSE T
4710 POKE 16437,255
4720 CLS
4800 IF P(B)<6 THEN GOTO 2300
5000 LET O(B)=O(B)+D
5010 LET P(B)=C
5020 LET B(D(D))=B(D(D))-D
5030 LET B$(F,D(D),E,D)=CHR$ (CO
DE B$(F,D(D),E,D)+D)
5040 LET A=D(D)
5050 LET D(D)=D(E)
5060 LET D(E)=A
5065 IF D(D)=C THEN GOTO 5080
5070■IF B(D(D))=C THEN LET D(D)=
C
5090 IF D(D)<>C THEN LET D$=A$(F
,D(D))
5100 GOSUB 9500
5110 IF MA=6 THEN LET B$(F,D(E),
E,E)=CHR$ (CODE B$(F,D(E),E,E)+D
)
5120 LET MA=C
5130 LET H$(B,O(B))=CHR$ E(B)
5200 IF O(B)<20 THEN GOTO 2100
5250 GOTO 7000
6900 IF P(B)<6 THEN GOTO 6940
6910 LET O(B)=O(B)+D
6920 LET P(B)=C
6925 LET H$(B,O(B))=CHR$ E(B)
6930 LET B$(F,D(D),E,D)=CHR$ (CO
DE B$(F,D(D),E,D)+D)
6940 LET B$(F,D(D),E,D)=CHR$ (CO
DE B$(F,D(D),E,D)+P(B)*10)
7010 PRINT ,,E$(B);" HAVE SCORED
 ";E(B);" FOR ";W(B)
7050 LET IN=IN+D
7060 PAUSE 200
7070 POKE 16437,255
7080 CLS
7090 IF IN=3 THEN GOTO 7520
7100 LET X=B
7110 LET B=F
7120 LET F=X
7150 LET D(D)=C
7160 LET D(E)=C
7400 GOTO 1600
7520 IF E(B)>E(F) OR (E(B)=E(F)
AND W(B)<W(F)) THEN GOTO 7600
7530 IF E(B)<E(F) OR (E(B)=E(F)
AND W(B)>W(F)) THEN GOTO 7700
7550 PRINT "THE RESULT IS A TIE"
7570 GOTO 7800
7600 IF E(B)>E(F) THEN PRINT E$(
B);" HAVE WON BY ";10-W(B);" WKT
";("S" AND 10-W(B)>D)
7610 IF E(B)=E(F) THEN PRINT E$(
B);" HAVE WON BY LOSING","FEWER
WICKETS"
7650 GOTO 7800
7700 IF E(B)<E(F) THEN PRINT E$(
F);" HAVE WON BY ";E(F)-E(B);" R
UN";("S" AND E(F)-E(B)>D)
7710 IF E(B)=E(F) THEN PRINT E$(
F);" HAVE WON BY LOSING","FEWER
WICKETS"
7800 PRINT ,,E$(F);" ";E(F);" FO
R ";W(F)
7810 PRINT ,,E$(B);" ";E(B);" FO
R ";W(B)
7850 GOSUB 7900
7890 STOP
7900 PRINT AT 11,C;" TO SEE ANAL
YSIS ENTER:"
7910 PRINT ,,"""1"" FOR ";E$(D)
7915 PRINT ,,"""2"" FOR ";E$(E)
7920 PRINT ,,"""3"" SCORE AT END
 OF EACH OVER"
7925 PRINT ,," TO RETURN ENTER "
"0"""
7930 INPUT X
7932 IF X=C THEN CLS
7935 IF X=C THEN RETURN
7938 IF X>3 THEN GOTO 7930
7940 IF X=3 THEN GOTO 8300
7945 PRINT ,,"ENTER ""BAT"" FOR
BATTING"
7950 PRINT "   OR ""BOWL"" FOR B
OWLING"
7960 INPUT Z$
7970 CLS
7980 IF Z$="BAT" THEN GOSUB 8000
7985 IF Z$="BOWL" THEN GOSUB 820
0
7990 GOTO 7900
8000 LET Y=D+(X=D)
8005 PRINT E$(X);" BATTING"
8008 PRINT
8010 FOR Z=D TO 11
8020 PRINT A$(X,Z);
8030 IF B$(X,Z,D,D)="■" THEN PRI
NT "■";(A$(Y,CODE B$(X,Z,D,E)) A
ND B$(X,Z,D,E)<>B$(X,Z,D,3));("
  AND   " AND B$(X,Z,D,E)=B$(X,Z,
D,3));
8035 IF B$(X,Z,D,D)="■" THEN PRI
NT "■";A$(Y,6);
8040 IF B$(X,Z,D,D)="■" THEN PRI
NT " [illegible] ";
8050 IF B$(X,Z,D,D)="■" THEN PRI
NT " [illegible] ";
8060 IF B$(X,Z,D,D)="■" THEN PRI
NT "   [illegible]        [illegible]";
8070 IF B$(X,Z,D,D)<>"■" AND B$(
X,Z,D,D)<>"■" AND B$(X,Z,D,D)<>"
" THEN PRINT TAB 17;"■";A$(Y,CO
DE B$(X,Z,D,3));
8080 IF B$(X,Z,D,D)="■" THEN PRI
NT "    NOT          OUT";
8090 IF B$(X,Z,D,D)<>" " THEN PR
INT TAB 32-LEN STR$ CODE B$(X,Z,
D,4);CODE B$(X,Z,D,4)
8100 IF B$(X,Z,D,D)=" " THEN PRI
NT
8110 NEXT Z
8120 PRINT "[illegible]",,"(BY ";F(X,
4);"  LB ";F(X,3);"  WI ";F(X,E)
;"  NB ";F(X,D);")";TAB 32-LEN S
TR$ F(X,5);F(X,5)
8130 PRINT ,,"[illegible] (";O(X);
8140 IF P(X)<>C THEN PRINT ".";P
(X);
8150 PRINT " OVERS) (";W(X);" WK
TS)";TAB 32-LEN STR$ E(X);E(X)
8160 PRINT ,,"FALL OF WICKETS"
8162 LET A=C
8165 FOR Z=D TO 9
8168 PRINT TAB A;CHR$ (Z+156);
8170 IF W(X)>=Z THEN PRINT TAB A
+5-LEN STR$ CODE F$(X,Z);CODE F$
(X,Z);
8172 LET A=A+9
8173 IF A=27 THEN LET A=C
8175 NEXT Z
8180 INPUT Z$
8185 IF Z$="Z" THEN COPY
8190 CLS
8195 RETURN
8200 PRINT E$(X),,"BOWLING";
8210 PRINT TAB 10;"OVERS MDNS  R
UNS  WKTS"
8220 FOR Z=D TO 10
8223 LET Y=CODE G$(X,Z)
8225 IF Y=C THEN GOTO 8270
8230 PRINT ,,A$(X,Y);
8235 LET A=CODE B$(X,Y,E,D)
8240 PRINT TAB 12;A-INT (A/10)*1
3;
8242 IF A<5 THEN GOTO 8250
8245 PRINT ".";INT (A/10);
8250 PRINT TAB 18;CODE B$(X,Y,E,
E);TAB 25-LEN STR$ CODE B$(X,Y,E
,3);CODE B$(X,Y,E,3);TAB 30;CODE
 B$(X,Y,E,4)
8260 NEXT Z
8270 INPUT Z$
8275 IF Z$="Z" THEN COPY
8280 CLS
8290 RETURN
8300 CLS
8305 PRINT "SCORE AT THE END OF
EACH OVER"
8310 IF IN=D THEN GOTO 8400
8320 PRINT ,,,,E$(F);" ";E(F);"
FOR ";W(F);" (";O(F);
8325 IF P(F)>0 THEN PRINT ".";P(
F);
8328 PRINT " OVERS)",,
8330 LET X=C
8340 FOR Z=D TO 20
8345 IF Z>9 THEN PRINT TAB X,CHR
$ (INT (Z/10)+156);
8347 IF Z<=9 THEN PRINT TAB X;"■
";
8350 PRINT TAB X+D,CHR$ (Z-(INT
(Z/10)*10)+156);
8360 IF Z<=O(F) THEN PRINT TAB X
+6-LEN STR$ CODE H$(F,Z),CODE H$
(F,Z);
8370 LET X=X+8
8380 IF X=32 THEN LET X=C
8390■NEXT Z
8395 PRINT
8400 PRINT ,,,,E$(B);" ";E(B);"
FOR ";W(B);" (";O(B);
8405 IF P(B)>0 THEN PRINT ".";P(
B);
8408 PRINT " OVERS)",,
8410 LET X=C
8420 FOR Z=D TO 20
8425 IF Z>9 THEN PRINT TAB X,CHR
$ (INT (Z/10)+156),
8427 IF Z<=9 THEN PRINT TAB X;"■
";
8430 PRINT TAB X+D,CHR$ (Z-(INT
(Z/10)*10)+156),
8440 IF Z<=O(B) THEN PRINT TAB X
+6-LEN STR$ CODE H$(B,Z);CODE H$
(B,Z);
8450 LET X=X+8
8460 IF X=32 THEN LET X=C
8470 NEXT Z
8480 INPUT Z$
8482 IF Z$="Z" THEN COPY
8485 CLS
8490 GOTO 7900
8500 LET F1=INT (RND*X1)+D
8510 GOTO 2400
8520 LET F2=INT (SQR (RND*X2**E)
)+D
8525 LET F2=F2-INT (RND*F1/X1*F2
*(20-O(B))/(20-W(B)))
8530 IF F2<D THEN LET F2=D
8535 GOTO 2500
8540 IF RND<(ABS (E-B(D(D)))+E)/
4 THEN GOTO 2300
8550 LET X=C
8560 FOR Z=D TO 11
8570 IF Z<>D(E) AND B(Z)>C THEN
LET X=X+D
8580 NEXT Z
8590 LET Y=INT ((RND*X**((L+3)/4
))**(4/(L+3)))+D
8600 LET X=C
8610 FOR Z=D TO 11
8620 IF Z<>D(E) AND B(Z)>C THEN
LET X=X+D
8630 IF Y=X THEN GOTO 8650
8640 NEXT Z
8650 LET D(D)=Z
8660 LET D$=A$(F,Z)
8670 GOTO 2260
9000 IF IN=E AND R<4 AND E(B)+R>
E(F)+D THEN LET R=E(F)+D-E(B)
9005 IF RND<.2 THEN GOTO 9060
9010 LET LB=R
9020 PRINT LB;" LEG BYE";("■" AN
D LB>D)
9030 IF LB=D OR LB=3 THEN GOSUB
9500
9040 LET F(B,3)=F(B,3)+LB
9050 GOTO 9100
9060 LET BY=R
9070 PRINT BY;" BYE";("■" AND BY
>D)
9080 LET F(B,4)=F(B,4)+BY
[illegible] IF BY=D OR BY=3 THEN GOSUB
[illegible]
9100 LET R=C
9110 LET E(B)=E(B)+LB+BY
9120 LET LB=C
9130 LET BY=C
9140 GOTO 4370
9200 LET R=E(F)+D-E(B)
9210 GOTO 4300
9500 LET A=B1
9510 LET B1=B2
9520 LET B2=A
9530 LET A=C(D)
9540 LET C(D)=C(E)
9550 LET C(E)=A
9560 LET C$(D)=A$(B,C(D))
9570 LET C$(E)=A$(B,C(E))
9590 RETURN
9600 PRINT ,,"[illegible] ";D$;" OVER
 NO. ";5-B(D(D))
9610 PRINT TAB 13,"DELIVER NO. "
;P(B)
9620 RETURN
9700 PRINT E$(F);" CHOOSE YOUR B
OWLER","MAXIMUM 4 OVERS EACH"
9710 PRINT ,,"NO. PLAYER";TAB 16
;"MAX.";TAB 22;"AVALIBLE";TAB 16
;"POWER";TAB 22;"OVERS"
9730 FOR Z=D TO 11
9740 PRINT TAB E-LEN STR$ Z;Z;TA
B E;("*" AND D(D)=Z)+("+" AND D(
E)=Z)+("=" AND Z=6);TAB 4;A$(F,Z
);TAB 17+(Z=6);(Z+9 AND Z<>6);TA
B 24;B(Z)
9750 NEXT Z
9760 PRINT ,,"ENTER NO. OF SELEC
TED BOWLER"
9770 PRINT ,,"""*"" = BOWLER DUE
 TO BOWL"
9780 PRINT """+"" = BOWLER OF LA
ST OVER"
9790 PRINT """="" = WICKET KEEPE
R"
9800 INPUT A
9810 IF A<D OR A>11 THEN GOTO 98
00
9820 IF D(E)=A OR B(A)=C THEN GO
TO 9800
9830 LET D$=A$(F,A)
9870 LET D(D)=A
9880 CLS
9890 RETURN
9900 PRINT ("1ST" AND IN=D)+("2N
D" AND IN=E)," INNINGS"
9905 IF ZX>0 THEN PRINT AT C,18;
"LEVEL ";L
9910 PRINT ,,E$(B);TAB 12;"SCORE
";TAB 21-LEN STR$ E(B),E(B);TAB
22;" FOR ";TAB 28-LEN STR$ W(B);
W(B)
9920 PRINT ,,"[illegible]";TA
B 14+(C(D)<10);"(";C(D);")";C$(D
);TAB 30-LEN STR$ B1;B1
9930 PRINT ," OTHER BATSMAN";TA
B 14+(C(E)<10);"(";C(E);")";C$(E
);TAB 30-LEN STR$ B2;B2
9940 PRINT ,,"COMPLETED OVERS ";
O(B);TAB 20;"EXTRAS";TAB 30-LEN
STR$ F(B,5);F(B,5)
9950 IF IN=D THEN RETURN
9960 PRINT ,,E$(F);" SCORED ";E(
F);" FOR ";W(F)
9990 RETURN
```





NOTE TESTER



```
  1 LET A=7
  8 PRINT
  9 PRINT
 10 FOR B=1 TO 5
 20 FOR N=0 TO 10
 30 PRINT "-";
 40 NEXT N
 45 PRINT
 46 PRINT
 50 NEXT B
 60 PRINT AT 0,0;" ████"
 70 PRINT "  █ █"
 80 PRINT " -█-█"
 90 PRINT "  █ █"
100 PRINT " -█-█"
110 PRINT "  ██"
120 PRINT " -██"
130 PRINT " ████"
140 PRINT " ██-█"
150 PRINT " ████"
160 PRINT " -█"
170 PRINT "  █"
180 PRINT " ██"
190 PRINT " ██"
200 LET B=INT (RND*11)+1
210 PRINT AT B,A;"█"
215 IF B>=8 THEN LET B=B-7
220 LET B=(11-B)+34
230 PRINT AT 15,10;"YOUR GUESS?
240 INPUT A$
250 IF CODE A$<>B THEN PRINT AT
15,10;"    WRONG    "
260 IF CODE A$=B THEN PRINT AT
15,10;"    RIGHT    "
270 PAUSE 4E4
275 CLS
280 RUN
```

IF YOU do not know your notes but want to learn, **Note Tester** from A J Robinson of Monks Risborough, Bucks for the 1K ZX-81 is bound to help. The display features a treble stave and a blob at some random position on it. The blob represents a musical note which you have to guess, or know.

The computer will tell you whether you are correct and will then wait for you to press any key before RUNning once again.

Listing buffs might like the way the random number is linked to the note through CHR$.

STANDARD DEVIATION



```
  10 REM "MEAN AND DEVIATION"
  20 PRINT "(1) ENTER NUMBER OF
VARIABLES"
  30 INPUT N
  40 PRINT "(2) ENTER EACH VARIA
BLE DATA AND FREQUENCY DISTRIBUT
ION"
  50 PAUSE 150
  60 CLS
  70 PRINT TAB 1;"X";TAB 7;"F";T
AB 14;"FX";TAB 21;"FX**2"
  75 PRINT "--------------------
-------"
  80 LET TX=0
  90 LET TF=0
 100 LET TFX=0
 110 LET TFX2=0
 120 FOR C=1 TO N
 130 INPUT X
 140 INPUT F
 150 PRINT TAB 1;X;TAB 7;F;TAB 1
4;X*F;TAB 21;X**2*F
 170 LET TF=TF+F
 180 LET TFX=TFX+X*F
 190 LET TFX2=TFX2+X**2*F
 192 NEXT C
 195 PRINT "--------------------
-------"
 200 PRINT TAB 7;TF;TAB 14;TFX;T
AB 21;TFX2
 205 PRINT TAB 6;"==============
======="
 210 PRINT
 220 LET AM=TFX/TF
 230 LET SD=SQR (TFX2/TF-AM**2)
 250 PRINT "ARITHMETIC MEAN=";AM
 255 PRINT
 260 PRINT "STANDARD DEVIATION="
SD
 270 STOP
```

STANDARD DEVIATION is a measure used in statistics of the scatter of a series of numbers or measurements around their mean value. This program for the ZX-81 from David Lam, of London NW10, is a method of calculating both standard deviation and the arithmetical mean.

TAPE READER

TAPE READER is a useful routine to add to your ZX-81 software library. The bulk of the program is a machine code routine written into line one. It will read through a tape of programs and list the names of programs on that tape as it proceeds.

The program is easy to use. First type-in the program. The REM statement in line one must have 120 characters in it at least. Run the program to set up the machine code and then delete lines 5 to 60. The program is then ready to run.

Instead of typing LOAD" " before starting your cassette recorder type RUN 100 to start the reader program. Then start the tape.

Tape Reader was submitted by C M Woodman of Maybrook Gardens, High Wycombe.

```
   1 REM 1234567890123456789012З
45678901234567890123456789012345
67890123456789012345678901234567
890123456
   5 FOR I=16515 TO 16609
  10 POKE I,PEEK (I-15680)
  15 NEXT I
  20 POKE 16514,55
  25 POKE 16520,140
  30 POKE 16521,64
  35 POKE 16536,35
  40 LET A$="1114FF2A10400106000
9CD8C407123CB79C01D20F5C9C3A203"
  45 FOR I=1 TO 25
  50 POKE 16549+I,16*CODE A$(2*I
-1)+CODE A$(2*I)-476
  55 NEXT I
  60 STOP
 100 CLEAR
 105 DIM B$(20)
 110 FAST
 115 RAND USR 16514
 120 PRINT B$
 125 PAUSE 100
 130 POKE 16437,255
 135 RUN 100
```

MOST computer games require nothing except a quick finger on the cursor key. Most of the rest, those which require a bit of brain power, are adaptations of games when the word computer meant a Chinese woman with an abacus.

London Bridge is one of the few routines we have seen which is original, was written for the computer, and which calls for nerve, thought and luck.

The display consists of a graphic representation of the bridge, seen from above, with the roadway made up of a random mix of the numbers 1 to 5, representing five types of flagstone. You are required to cross to the other bank but, as you would expect, London Bridge is falling down.

The computer will give you a number, perhaps 4. That tells you that one of the type 4 stones is about to fall into the river. In selecting your next move, therefore, you can gamble by moving on to a 4 or play safe by selecting a different number.

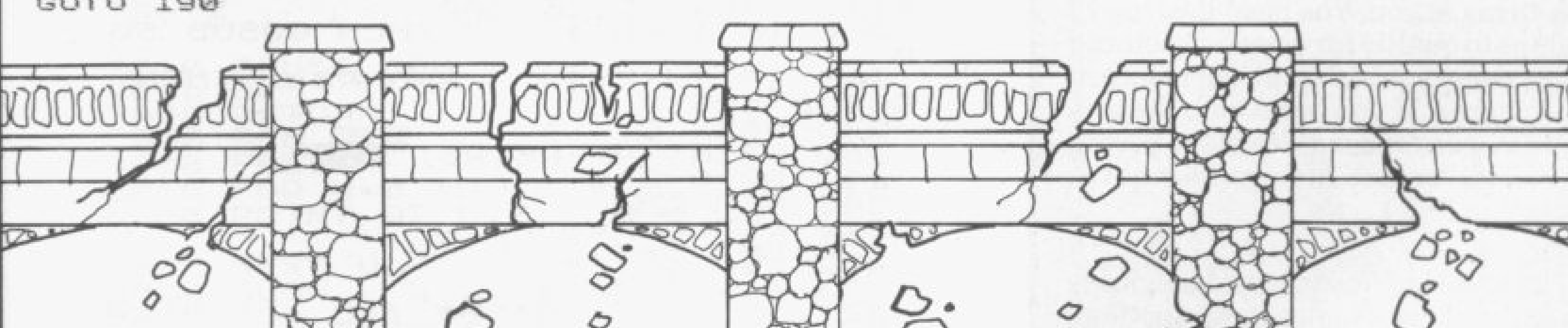
The player enters his move by following the nine-number grid displayed under "INPUT" in the bottom left of the screen; 7, for example, will move you left and down and 2 will send you directly backwards.

Invalid moves are ignored. You score 10, 20 or 50 points respectively for each move forwards, sideways or backwards, but taking risks trebles those scores and a high score is necessary to beat the world record of 1,700. Beware — don't dally too long at the start of the bridge — you may be cut off by successive collapses, and don't shilly-shally near the south bank because that is where the bridge is weakest.

We were very impressed by the program and counted ourselves lucky to manage a score of 1,900 after 12 attempts. Congratulations to J K Laskowski of London SE6 for an impressive listing for the 16K ZX-81.

LONDON BRIDGE

```
   5 FAST
  10 RAND 0
  20 DIM A(66)
  30 PRINT AT 2,9;"LONDON BRIDGE
"
  40 LET WR=1700
  50 PRINT AT 16,25;"WR=";WR;TAB
 11;"▒          ▒";TAB 0;"INPUT";TA
B 1;"123";TAB 1;"4■6";TAB 1;"789
"
  55 PRINT AT 6,11;"▒▒▒  ■  ▒▒▒"
  60 FOR I=1 TO 11
  70 PRINT TAB 12;"▒        ▒"
  80 NEXT I
  90 FOR N=11 TO 50
 100 LET A(N)=INT (RND*5+1)
 110 LET A$=CHR$ (28+A(N))
 120 LET M=(N-1)/5
 130 GOSUB 500
 135 NEXT N
 140 LET N=8
 145 SLOW
 150 LET A(N)=-28
 155 PRINT AT 20,20;"TO COLLAPSE
"
 160 LET DROP=INT (RND*(67-N)+N-
6)
 170 IF A(DROP)<=0 THEN GOTO 160
 180 PRINT TAB 25;A(DROP)
 190 INPUT DIR
 200 LET I=(INT DIR-1)/3
 205 LET M=(N-1)/5
 210 LET J=M-INT M+I-INT I
 220 LET N1=N+5*(INT I-1)+3*(I-I
NT I, -1
 230 IF DIR<1 OR DIR>9 OR J<0.1
OR J>1.4 OR N1<6 THEN GOTO 190
 235 IF A(N1)<=0 AND N1<=60 THEN
 GOTO 190
 240 IF N1>60 THEN LET A(N1)=-28
 250 LET A$=CHR$ (28+A(N))
 260 GOSUB 500
 270 LET M=(N1-1)/5
 280 LET A$=CHR$ (156+A(N1))
 290 GOSUB 500
 300 PRINT AT 20,20;"
";TAB 25;" "
 310 FOR J=1 TO 70
 320 NEXT J
 330 LET M=(DROP-1)/5
 350 LET A$=" "
 360 GOSUB 500
 370 IF N1=DROP THEN GOTO 600
 380 IF N1>60 THEN GOTO 800
 390 LET SCORE=10*(3-INT I)+10*(
2-INT I)*(1-INT I)
 400 IF A(N1)=A(DROP) THEN LET S
CORE=SCORE*3
 410 GOSUB 900
 420 LET A(DROP)=0
 430 LET N=N1
 440 GOTO 155
 500 PRINT AT 5+INT M,13+5*(M-IN
T M);A$
 510 RETURN
 600 PRINT AT 20,16;"YOU HAVE FA
LLEN";TAB 18;"IN THE WATER"
 700 STOP
 800 LET SCORE=1000
 810 GOSUB 900
 820 STOP
 900 LET A(1)=A(1)+SCORE
 910 PRINT AT 11,22;"SCORE ";SCO
RE;"  "
 920 PRINT AT 13,22;"TOTAL ";A(1
)
 930 RETURN
```



PHASOR

REMARKABLE graphics effects are the striking features of **Phasor** for the 16K ZX-81. You are an infamous space pirate travelling home through hyperspace after a hard day's murder and mayhem. Suddenly you find yourself wrenched back into real space/time by a squadron of Federation star-ships. You are hopelessly surrounded. Can you fight your last battle with style?

The view from your cockpit is of stars and galaxies in the blackness of space. Each attacking star-ship is an inverse O appearing at random positions around the screen. You are required to note in which column it appears, relate that to the letters at the bottom of the display and hit the appropriate key on the ZX-81.

If you miss, or delay too long, your assailant will take up position at screen centre and loose a series of devastating thermal bolts at your ship.

That is where the original graphics come in. The two energy beams from the Federation ship approach with a striking 3D effect. If they are on target, they rock your pirate ship by means of the FAST/SLOW loop in lines 1200 to 1240. Excellent.

You cannot fire at the ship when it is firing at you. You must destroy 15 ships to qualify for a new screen and the game speeds-up as each screen is cleared. If you break into the program, remember to re-start it with "RUN 2", since the program saves itself in line 1.

A series of honorary accolades is awarded for a high score. Anything above 1,050 gains the accolade of Starfalcon, Starhawk or Stareagle, depending on the level of difficulty selected. You will have to be good, though, since the author of the program, Marcus Harvey of Surbiton, Surrey, has managed a personal best of only 550.

```
   1 SAVE "█"
   2 CLS
   3 PRINT "PHASOR";AT 1,0;"████████",,
   4 PRINT "WHAT LEVEL OF DIFFICULTY?",,,
   5 PRINT "(1,2,OR 3)"
   6 INPUT X
   7 IF X>3 OR X<0 THEN GOTO 6
   8 LET INP=(1/INT X)*25
   9 CLS
  10 LET S=0
  11 LET SH=5
  12 LET P=20
  13 LET I=0
  15 CLS
  16 IF X=1 THEN LET A$=" FALCON"
  17 IF X=2 OR X=1 AND S=2100 THEN LET A$=" HAWK"
  18 IF X=3 OR X=2 AND S=2100 OR X=1 AND S=2850 THEN LET A$=" EAGLE"
  20 IF S=1050 OR S=2100 OR S=2850 THEN GOSUB 7000
  25 FOR N=1 TO 21
  30 PRINT "████████████████████████████████"
  40 NEXT N
  45 FOR M=1 TO 80
  50 LET R1=INT (RND*20)
  60 LET R2=INT (RND*26)
  80 PRINT AT R1,R2;"█"
  90 NEXT M
  95 FOR K=1 TO 10
 100 LET R3=INT (RND*20)
 110 LET R4=INT (RND*26)
 120 PRINT AT R3,R4;"█"
 130 NEXT K
 135 LET Q=38
 140 LET Z=0
 145 PRINT AT 21,Z;CHR$ Q
 150 LET Q=Q+1
 155 LET Z=Z+1
 156 IF Z=26 THEN GOTO 165
 160 GOTO 145
 165 PRINT AT 2,26;"SCORE:";AT 3,26;S
 170 PRINT AT 6,28;"S";AT 7,28;"H";AT 8,28;"I";AT 9,28;"E";AT 10,28;"L";AT 11,28;"D";AT 12,28;"S";AT 12,29;"=";AT 12,30;"5"
 180 PRINT AT 14,28;"P";AT 15,28;"H";AT 16,28;"A";AT 17,28;"S";AT 18,28;"O";AT 19,28;"R";AT 20,28;"S";AT 20,29;"=";AT 20,30;"20"
 200 REM ████████
 205 IF I=150 AND INP<>1 THEN LET INP=INP-1
 210 LET R5=INT (RND*20)
 220 LET R6=INT (RND*24)
 230 FOR C=1 TO INP
 235 LET R8=INT (RND*30)+1
 240 PRINT AT R5,R6;"███"
 241 IF I=150 THEN GOTO 11
 245 IF P=0 THEN GOSUB 500
 250 IF CODE INKEY$-38=R6+1 AND P<>0 THEN GOSUB 300
 260 IF INKEY$<>"" THEN GOSUB 500
 265 IF INKEY$="" AND R8=1 THEN GOSUB 525
 270 NEXT C
 280 PRINT AT R5,R6;"███"
 290 GOTO 210
 300 REM ███
 310 LET P=P-1
 320 LET S=S+10
 325 LET I=I+10
 330 PRINT AT 3,26;"      ";AT 3,26;S
 335 PRINT AT 20,30;"  ";AT 20,30;P
 340 FOR F=1 TO 5
 350 PRINT AT R5,R6;"███"
 360 PRINT AT R5,R6;"███"
 370 NEXT F
 375 PRINT AT R5,R6;"███"
 380 GOTO 200
```

PHASOR

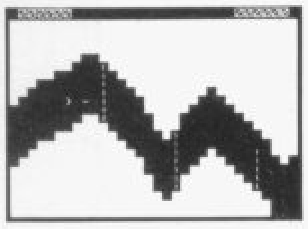


```
 500 REM [illegible]
 510 IF P<>0 THEN LET P=P-1
 520 PRINT AT 20,30;"  ";AT 20,3
0;P
 525 FOR J=1 TO 5
 530 PRINT AT 0,0;"ALIEN FIRES"
 535 NEXT J
 540 LET R7=INT (RND*3)+1
 545 PRINT AT 0,0;"███████████"
 546 GOSUB 1000
 550 IF R7<>1 THEN RETURN
 555 FOR Y=1 TO 5
 560 PRINT AT 0,0;"ALIEN HITS"
 565 PRINT AT 0,0;"██████████"
 566 NEXT Y
 570 LET SH=SH-1
 580 IF SH<0 THEN GOTO 1000
 590 PRINT AT 12,30;SH
 600 RETURN
1000 REM STAR GRAPHICS
1005 PRINT AT R5,R6;"███"
1010 PRINT AT 10,11;"█@█"
1015 FOR L=1 TO 5
1020 PRINT AT 11,11;"▙";TAB 13;"
▟"
1030 PRINT AT 11,11;"█";TAB 13;"
█"
1040 PRINT AT 12,10;" ";TAB 14;"
 "
1050 PRINT AT 12,10;"█";TAB 14;"
█"
1060 PRINT AT 13,8;"  ";TAB 15;"
  ";AT 14,8;"  ";TAB 15;"  "
1070 PRINT AT 13,8;"██";TAB 15;"
██";AT 14,8;"██";TAB 15;"██"
1080 PRINT AT 15,4;"    ";TAB 17
;"    ";AT 16,4;"    ";TAB 17;"
    ";AT 17,4;"    ";TAB 17;"
    ";AT 18,4;"    ";TAB 17;"    "
1090 PRINT AT 15,4;"████";TAB 17
;"████";AT 18,4;"████";TAB 17;"█
███";AT 16,4;"████";TAB 17;"████
";AT 17,4;"████";TAB 17;"████"
1100 PRINT AT 19,0;"      ";TAB 21;
"      ";AT 20,0;"      ";TAB 21;"
      "
1110 PRINT AT 19,0;"██████";TAB 21
;"██████";AT 20,0;"██████";TAB 21;"█
█████"
1111 IF R7<>1 THEN PRINT AT 10,1
1;"███"
1115 IF R7<>1 THEN RETURN
1200 FOR F=1 TO 10
1210 FAST
1220 SLOW
1230 NEXT F
1240 NEXT L
1242 PRINT AT 10,11;"███"
1245 IF SH<>0 THEN RETURN
1247 GOSUB 8000
2010 PRINT AT 0,0;"HIT ""R"" FOR
 NEW GAME."
2020 IF INKEY$="R" THEN RUN 2
2030 GOTO 2020
7000 PRINT AT 1,1;"CONGRATULATIO
NS";AT 2,1;"                  ";AT
4,1;"WE HEREBY AWARD YOU THE TIT
LE";AT 5,1;"OF: ""STAR";A$;"""."
;AT 8,1;"KEEP ON FIGHTING, COWBO
Y."
7010 PAUSE 300
7020 CLS
7030 RETURN
8000 REM END
8010 FAST
8015 FOR U=0 TO 20
8020 PRINT AT U,0;"
                                "
8025 NEXT U
8030 SLOW
8035 FOR U=1 TO 80
8040 LET R9=INT (RND*4)+1
8050 IF R9>1 THEN LET B$="."
8060 IF R9=1 THEN LET B$="▪"
8070 PRINT AT INT (RND*20),INT (
RND*26);B$
8080 NEXT U
8100 RETURN
```

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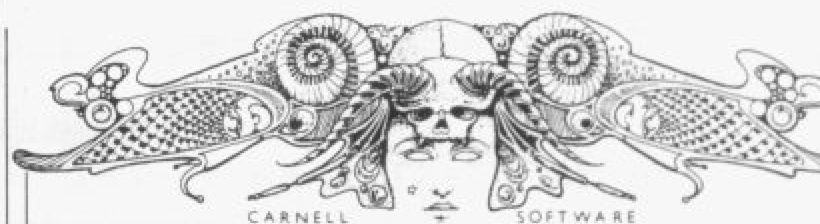
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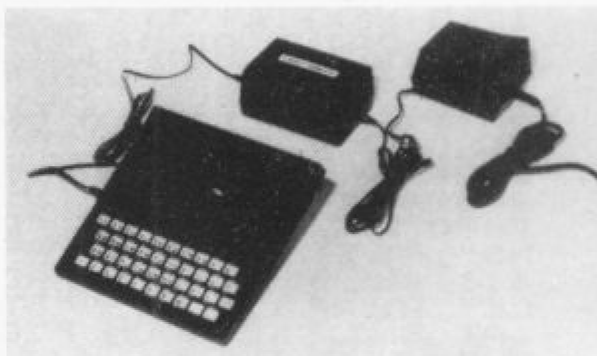
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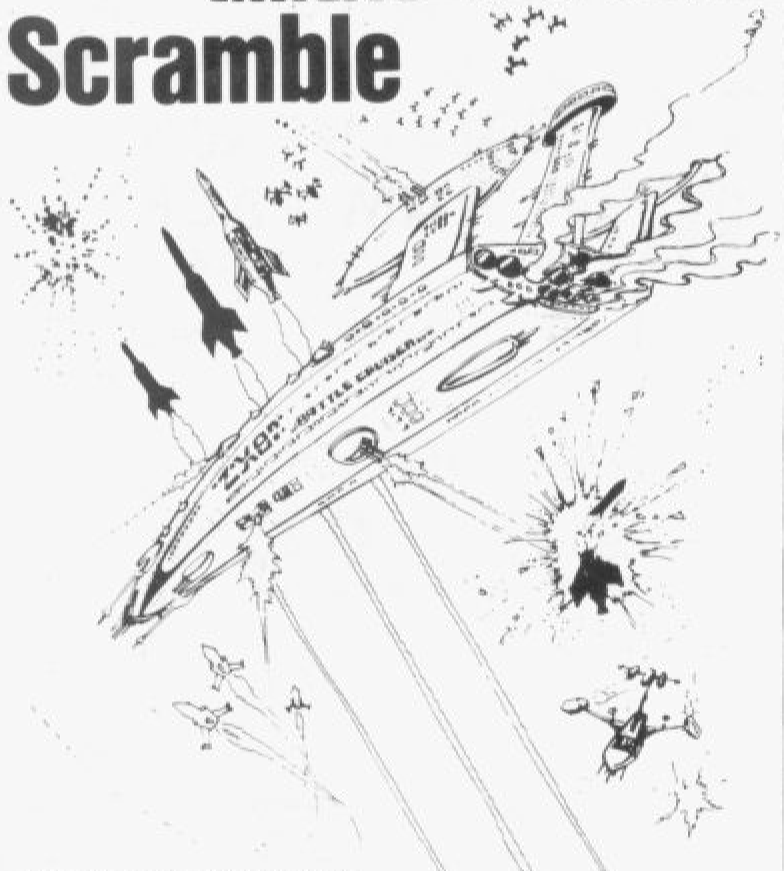
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Andrew Hewson.



Talking direct to the machine improves uses

MANY PEOPLE are interested in using machine code but find it difficult to master. Books on the market include *Mastering Machine code on your ZX-81* by Toni Baker and several by Ian Logan. The best, in my opinion, on the Z-80 microprocessor is *How to Program the Z-80* by Rodnay Zaks.

One of the easiest ways to learn is to copy a few examples and to try and see how they work. This month I have written two machine code routines in response to requests from readers. The first request is from Chris Chatwin of Wakefield, who asks:

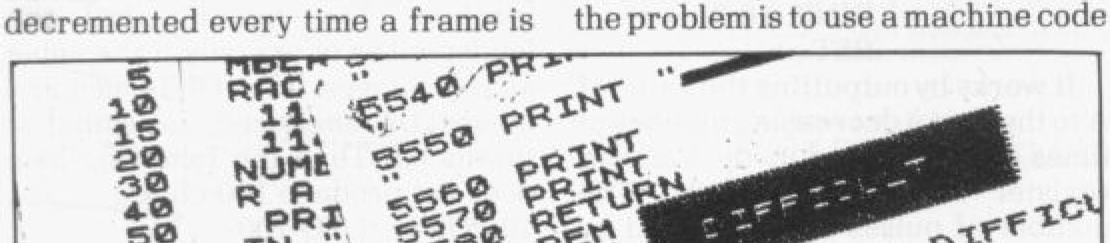
"Is there any way in which an interval timer can be incorporated into a program for the ZX-81 and displayed on the screen?"

The best way to run a clock on both the ZX-81 and the Spectrum is to monitor the FRAMES system variable. In the ZX-81 it is held at 16436 and 16437 and is decremented every time a frame is sent to the TV screen — see page 179 of *ZX-81 Basic Programming*. Provided the ZX-81 is in SLOW mode, intervals of up to 10 minutes or so can be measured to reasonable accuracy without difficulty. The following Basic routine displays the elapsed time:

```
10 PAUSE 0
20 LET T = 65279-PEEK 16436-256
*PEEK 16437
30 PRINT AT 0,0;INT (T/3000);
"MINS";
INT (T/50); "SECS"
40 GOTO 20
```

Line 10 re-sets the FRAMES variable to its starting value, effectively 65279. Line 20 loads the number of frames displayed into T and line 30 converts the results to minutes and seconds. After about 10 minutes the FRAMES variable has been decremented to its final value and it is re-set automatically to the starting value.

The routine takes about half a second to execute, so that a program which called it at a number of separate points, so that the display of elapsed time was more or less continuous, would be slowed considerably. The only solution to the problem is to use a machine code routine to monitor the FRAMES counter and display the current value on the screen. Here are two routines which together perform the task.



The first routine listed in table one is called initially to save the current PRINT position in the display file in the printer buffer. That permits the second routine to PRINT the current elapsed at the same point in the display without using the PRINT AT command.

The second routine is called whenever the elapsed time is to be displayed and is shown in table two. The routine works by restoring the value of DP-CC from the printer buffer and writing blank characters over the previous display. It then loads the value of FRAMES into HL and divides by 50 by repeated subtraction, because 50 frames are displayed per second.

Hex code	Assembler code
2A OE 40	LD HL (16398)
22 3C 40	LD (16444), HL
C9	RET

Table 1. The initialising routine.

The number of seconds elapsed is transfered from BC to HL and the number of minutes elapsed is calculated by dividing by 60. The ROM routine at 2712 is used to PRINT the number of minutes at the current position. The PRINT position is incremented and then the ROM routine is called again to PRINT the number of seconds. The routines can be loaded using a simple hex loader, for example:

```
10 REM AT LEAST 80
CHARACTERS
20 for I = 16514 TO 16600
30 INPUT Z$
40 IF Z$ = "S" THEN STOP
50 PRINT Z$;" ";
60 POKE I, 16*CODE Z$ + CODE
Z$(2)-476
70 NEXT I
```

The REM statement in line 10 must contain at least 80 characters.

continued on page 74







continued from page 73

The routines are loaded by running the program and entering each two-character hex code in turn. The following program demonstrates the elapsed time counter in action:

```
2000 PRINT AT 10,14;
2010 RAND USR 16514
2020 PAUSE 0
2030 RAND USR 17621
2040 GOTO 2030
```

The following Basic routine is slow to execute but it illustrates the use of the OUT command to generate a buzz and flash the BORDER:

```
10 LET a = 0
20 FOR b = 255 TO 0 STEP-1
30 OUT 245, a
40 LET a = a + 15-256*(a>238)
50 NEXT b
```

Line 40 increases the value of a by 15 so that bit 4 changes almost every time and the colour of the BORDER is altered.

There is also an OUT command in Z-80 machine code. The following program loads a machine code routine from the DATA statement and calls it at line 200:

```
10 DATA 6, 10, 197, 6, 192, 197, 16, 254, 211, 254, 198, 15, 193, 16, 246, 193, 16, 240, 201
100 FOR i = 0 TO 18
110 READ a
120 POKE 326000 + i,a
130 NEXT i
140 RANDOMIZE USR 326000
```

The machine code routine in the DATA statement is as follows:

```
          LD B, 10
Repeat    PUSH BC
          LD B, 192
Pulse     PUSH BC
Delay     DJNZ,-2 Delay
          OUT 254,(A)
          ADD 15
          POP BC
          DJNZ,-10 Pulse
          POP BC
          DJNZ,-16 Repeat
          RET
```

It works by outputting the value of A to the port a decreasing number of times as determined by the value in register B — initially 192. The number of pulses is determined by the value first loaded into B, i.e., 10. The characteristics of the routine can be varied by altering those two values, i.e., by altering the second and fifth items in the DATA statement.

Philip Evans of Manchester has a Spectrum. He writes: **"I have found the BEEP command very limited. How could I make proper explosions — "Booomms" and "Whhhamms" — in machine code?"**

I do not think it is possible to produce a sound like an explosion with the simple tone generator in the Spectrum. Nevertheless, it is certainly possible to generate more interesting sounds than the simple BEEP using the OUT command.

Chapter 23 of *ZX Spectrum Basic Programming* gives a brief introduction to the IN and OUT commands. It states in particular that the loudspeaker is driven from data line D4 of port 254. In other words, the Basic command OUT 254, a

where a is an integer between 0 and 255, drives the loudspeaker. There are a number of important points about this command.

The first, that the speaker is driven from data line D4, means that it is bit 4 of the binary equivalent of a which is important. Bits are counted from the right, starting at zero, so that if, for example, a is 37 which is 00100101 in binary, then bit 0 is 1, bit 1 is 0, bit 2 is 1, bit 3 is 0, bit 4 is 0. A few minutes' work with pencil and paper shows that numbers in the range 0 to 15 have bit 4 set to zero, 16 to 31 have bit 4 set to one, 32 to 47 have bit set to zero.

The second point is that the port is latched. That means that the loudspeaker clicks only if the value on D4 changes. If the OUT command leaves D4 unaltered, no sound is produced. Thus the following loop does not produce 100 clicks:

```
10 FOR i = 1 TO 100
20 OUT 254, 16
30 NEXT I
```

It produces a click the first time the OUT command is executed, because D4 is set to one, whereas previously it was zero but subsequently D4 remains set to one and so no click is produced.

The final point is that port 254 is also used to output data to the MIC socket and to determine the BORDER colour and so the value of a will effect the BORDER colour temporarily. Certain commands, e.g., LIST, will restore the BORDER to its original colour using the value stored in BORDER at 23624.

Hex code	Assembler code	Comment
2A 3C 40	LD HL, (16444)	Restore DP-CC
22 OE 40	LD (16398), HL	
3E 00	LD A, O	Clear previous display
77	LD (HL), A	of elapsed time
23	INC HL	
77	LD (HL), A	
23	INC HL	
77	LD (HL), A	
23	INC HL	
77	LD (HL), A	
23	INC HL	
77	LD (HL), A	
21 FF FE	LD HL, 65279	load FRAMES
ED5B 3440	LD DE, (16436)	into HL
A7	AND A	
ED 52	SBC HL, DE	Calculate seconds
11 32 00	LD DE, 50	
01 FF FF	LD BC, 65535	by dividing by 50
A7	AND A	
ED 52	SBC HL, DE	
03	INC BC	
30 FB	JRNC-5	
60	LD H, B	Transfer elapsed
69	LD L, C	seconds to HL
01 FF FF	LD BC, 65535	Calculate minutes
11 3C OO	LD DE, 60	by dividing by 60
A7	AND A	
ED 52	SBC HL, DE	
03	INc BC	
30 FB	JRNC,-5	
CD 98 OA	CALL 2712	Call ROM
19	ADD HL, DE	routine to display minutes
44	LD B, H	Save seconds
4D	LD C, L	in BC
2A OE 40	LD HL, (16398)	Leave one space between
23	INC HL	minutes and seconds
22 OE 40	LD (16398), HL	
CD 98 OA	CALL 2712	Call ROM routine
C9	RET	to display seconds

Table 2. Routine to display elapsed time.

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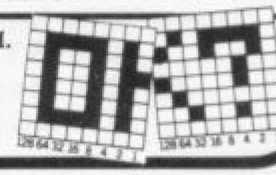
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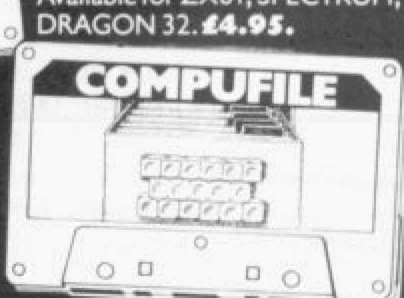
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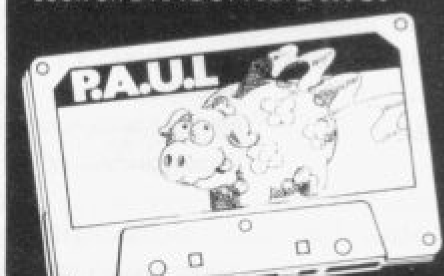
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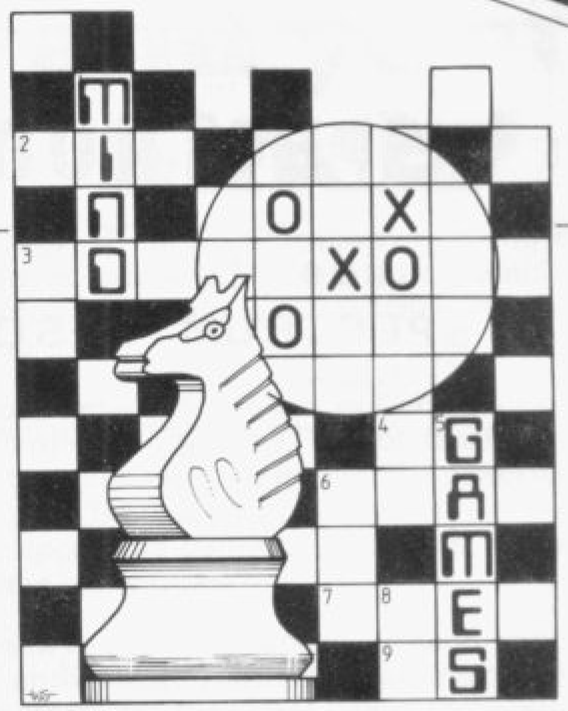
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Philip Joy looks at a new cassette which is the perfect way to end a long, tiring day

Finding ways of winding down



FIRST this month a review of a new game, **Diceroll**, from John Williamson. The idea is to total 31 by turning dice in a special manner. It was very easy to load, which is something about which most people will be pleased.

From the screen display it was difficult to see exactly what was happening at first. Compared to the Close the Box game, which has been reviewed, it is not up to his standard. With Nim, Close the Box, and this, it should please most people who like relaxing games. The cassette is available from John Williamson, Dunrobin Software, 37 Rivaldsgreen Crescent, Linlithgow, West Lothian. He says that his family found the game interesting.

Here are two games played against the Artic Computing ZXchessII. The ZX-81 plays black in both games and the sender plays white.

	White	Black
1	E2 - E4	E7 - E5
2	G1 - F3	B8 - C6
3	F1 - C4	F8 - C5
4	B1 - C3	G8 - F6
5	C4 × F7	E8 × F7
6	F3 - G5	F7 - G6
7	H2 - H4	D7 - D5
8	H4 - H5	G6 × G5
9	D2 - D3	C5 - E3
10	C1 × E3 MATE	

The game was played at level 0.

	White	Black
1	E2 - E4	E7 - E5
2	G1 - F3	B8 - C6
3	B1 - C3	G8 - F6
4	F1 - C4	F8 - C5
5	C4 × F7	E8 × F7
6	F3 - G5	F7 - G6
7	H2 - H4	D8 - E7
8	H4 - H5	G6 - H6
9	G5 - F7	E7 × F7
10	D2 - D4	G7 - G5
11	C1 × G5	H6 × G5
12	D1 - D2	G5 - G4
13	F2 - F3	G4 - G3
14	D2 - G5	F6 - G4
15	G5 × G4 MATE	

The game was played at level 4.

For anyone interested in writing their own chess games, a good book to buy is *Sargon, a computer chess program*, by Dan and Kathie Spracklen. It includes a complete assembly program in Z-80 machine code for a chess program. Some of the routines included will need changing for the ZX-81 or Spectrum but the main program will go on unchanged. Many of the commercial programs for chess start from this basic program and expand on it.

I would like to include some comments about adventure games from Mike Farley. He says that any game advertised as a new set of dungeons each time the game is played cannot be a real adventure. Games such as **Catacombs**, **Perilous Swamp** and **Oracles' Cave** were in this category. This view could be taken either way but I feel that a real adventure should have the same story each time it is tried.

'Random mazes are games of luck. Real adventures need large amounts of thinking power'

Games where things change are more like random mazes and random mazes need no real thinking but are luck games. Real adventures need large amountks of thinking power, so the random maze games should not be called adventures.

Farley comments that the best adventure games he has bought are Artic Adventures. He says that he solved A and B in a few hours but C needed much longer. So if you are looking for a real adventure, C is the best one.

Next month I hope to review a flight simulator written in Basic and some more programs. If you are a software producer and produce mind games, please send them to the address below. If you want them returned please send a SAE with your details. Also if you have bought any mind games, send your comments on them. I can then let other readers know which games are the most popular and any comments about any of them.

Here is a puzzle, with no prize, but the answer will be published next month. I hope to include one puzzle a month, which will need the computer and your thinking power to solve. If you have puzzles you have devised, send them. Remember, though, it should require the use of a computer, and some thinking so that it is a mind puzzle.

The puzzle is to find the sum of all the prime numbers below 5,000; taking the first one as being 1, and add to it all the prime numbers below 5,000. I will include the first program sent on either the ZX-81 or the Spectrum to solve the problem. Send the sum with your program. The answer to the puzzle will be provided next month and the program at a later date.

The address to which to write is Philip Joy, 130 Rush Green Road, Romford, Essex RM7 0QA.

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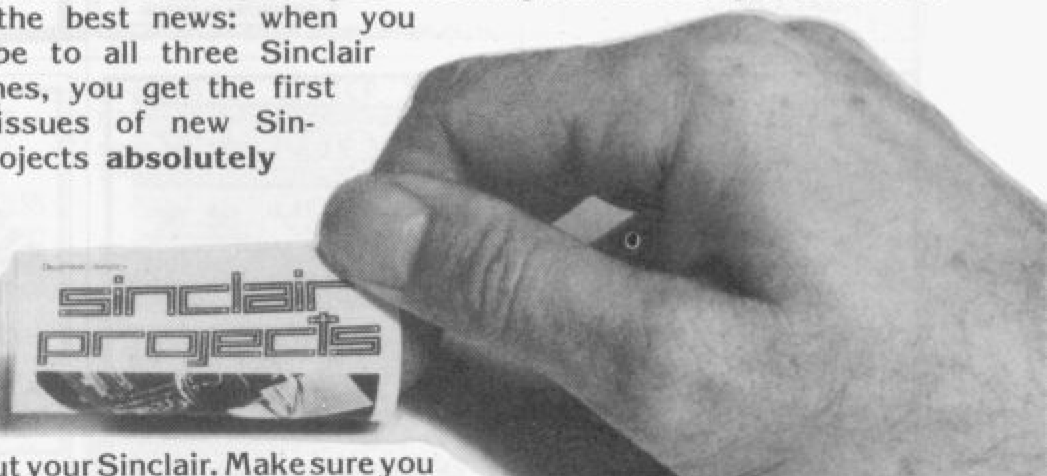
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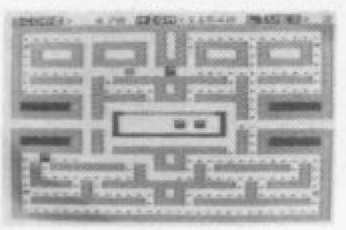
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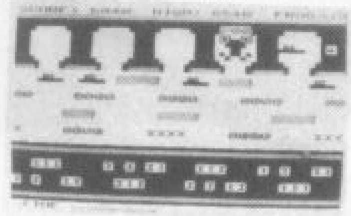
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(eleven 1k programs)

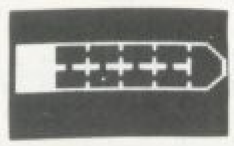
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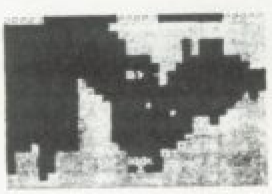


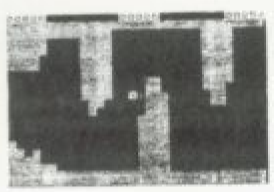
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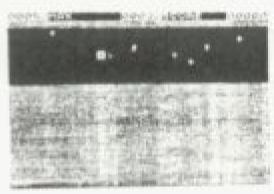
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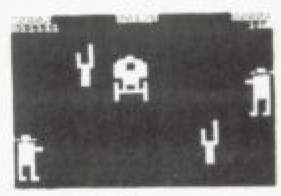
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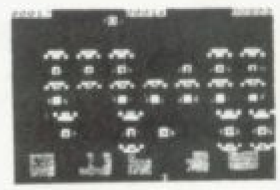


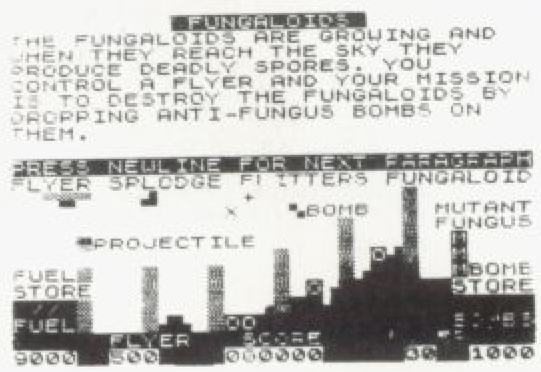


GUNFIGHT
(machine code)



INVADERS
(machine code)





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